People's Environmental Stewardship Elements Framed Through Sense of Place

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DEDICATION

My dissertation is dedicated to my great-uncle David Rollings who encouraged my love of words and writing. Also, I would like to dedicate this work to Kelly Brown for her mentorship and friendship.

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I would like to acknowledge all my friends, family, and colleagues who motivated me in their various ways.

Amber Jane Rollings

PEOPLE'S ENVIRONMENTAL STEWARDSHIP ELEMENTS FRAMED THROUGH SENSE OF PLACE

Indianapolis, Indiana is a sprawling city making it an exceptional locale to pursue environmental learning and stewardship research, particularly in the urban context. To achieve improved understanding of people's attitudes and behaviors towards their natural environment and resources, research was conducted on different local populations of Indianapolis and surrounding metropolitan area. The research's overall aim was to provide greater insight through sense of place on environmental perceptions and actions. The studied subpopulations included families, community members, and young adults and utilized mixed methods to frame inquiry. The qualitative and quantitative data approaches, such as survey instruments and semi-structured interviews, provided multiple avenues of results that could be corroborated to strengthen and confirm outcomes. Each project investigated how people perceive their responsibilities and participate in aspects that are important to environmental sustainability while also identifying potential driving mechanisms for their current and potential behaviors. Extant literature proposes that sense of place can affect a number of dimensions including people's environmental intentions and behaviors. The context of each project considered how sense of place theory intertwined within the outcomes of environmental stewardship. Environmental stewardship is an important means for providing remediation and mitigation, as well as cultivating an ecologically responsible society. Families showed critical overlap in greater environmental awareness and action when topics were near respective residences and immediate surroundings, while informal interaction and formal intervention outlined

how consequential messaging and experiential aspects can be when connecting people to resources or areas that are not considered home or familiar. The research suggests conclusive evidence on how to inform and guide on effective modes for producing environmental awareness, knowledge, and stewardship in order to build a more sustainable future.

Gabriel Filippelli, PhD, Chair

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter One

Introduction

Exploring Environmental Stewardship

Indianapolis, Indiana is the 17th most populous in the nation in 2019 with an estimated population of over 875,000 people (Infoplease, 2020). Urban environmentalism is an important dimension to understand as cities dominate globally in terms of the number of people they contain along with their continuous projected growth, a 21st century ecological phenomenon (Newman & Jennings, 2008). Current and future generations will confront complex environmental issues that require micro- to macro-scaled solutions. These issues will become worse if not responded to appropriately. **Understanding how individuals and groups learn about environmental issues, or if they do, is key to informing on methods to pursuing local and global sustainability.** "More attention is now being given to an understanding of the learning process and the capacities of individuals and communities needed to help resolve complex socioecological issues" (Wals et al., 2014, p. 583). The population and urban landscape make Indianapolis an ideal locale in which to research environmental awareness, knowledge, and stewardship.

Government agencies are often the entities that address restoration and mitigation of environmental issues, but they tend to lack the resources for implementation (Romolini et al., 2012). While existing institutions attempt to address these multi-scalar issues, their solutions remain only partial answers as their lack of capacity and implementation cannot keep up with the pace and the complexity of the problems (Walker et al., 2009). When considering solutions for human well-being and ecological concerns, civil society needs

to be part of the remedy as "it is the collective actions of individuals that lie at the heart of the dilemma" (Ehrlich & Kennedy, 2005, p. 562). Civil society has a major role to play in understanding and addressing complex environmental problems as its role can legitimize agreements developed to create processes of change (Walker et al., 2009). "Strong backing by a majority for collective action, even though it may restrict individual freedom, is necessary to institute and uphold an agreement" (Walker et al., 2009, p. 1346). Despite societal convention producing an environmentally alienated culture, there still remains an inherent interconnectedness between people and nature (Chapin et al., 2011).

Citizen-based stewardship is gaining ground in addressing ecological issues and providing viable resources (Romolini et al., 2012). Increased citizen-based environmental stewardship has become an important means of solving and aiding in remediation and mitigation concerns (Fisher et al., 2015; Romolini et al., 2012). Environmentally literate and responsive populations are key to the sustainability of our world and compensate for the lack of formal institutions' ability or interest in addressing environmental issues which adds to the complexity of problems. In addition, citizens' attention can help drive initiatives to spur organizations and other agencies actions towards environmental issues and can include polycentric governance outcomes (Dolan et al., 2015; Nagendra & Ostrom, 2012).

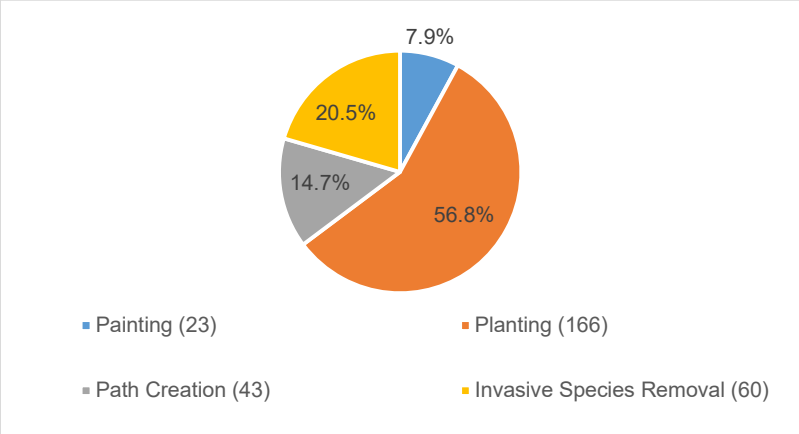
For example, Dolan et al. (2015) highlight local environmental stewardship action taken in Indianapolis regarding removal of invasive non-native species (INS). Residents were the original driving force for the creation of objectives that were included in a quality of life plan along with a taskforce focused on improving the perception and

ecological health of their communities' waterway, Fall Creek. "This project was motivated, not by sudden environmental crises, but by citizens' growing concern about the environmental, social, and economic impacts of an INS" (Dolan et al., 2015, p. 317). While government resistance prevailed due to the INS existing on city property and other resources were limited, an Indianapolis-headquartered corporation, Eli Lilly and Company (Lilly), helped to further facilitate action. Lilly funded and created resources through other nonprofits and collectives, such as Keep Indianapolis Beautiful and Reconnecting to Our Waterways. Lilly also supplied over 2,000 employees and other volunteers during their annual 2012 day of service who performed the INS removal for the Fall Creek communities (Dolan et al., 2015).

Lilly provides one of the largest day of services in civic engagement in Indianapolis with a multitude of projects organized, led, and implemented by their employees. Environmental stewardship is a theme of a number of projects that are conducted for the Lilly Day of Service (DOS) (Lilly, 2017). In 2016, as part of a post-DOS survey, volunteers who participated in environmental stewardship activities were asked additional Likert-scale questions. These survey items were designed to understand the effect of how well their projects promoted feelings of increased environmental identity as well as inspired future environmental behaviors. A total of 292 DOS participants completed the environmental sub-survey. For the environmental stewardship activities, there were a total of four project types: painting (n = 23), path creation (n = 43), planting (n = 166), and invasive species removal (n = 60) (Figure 1.1). Over 75% of participants performed planting or invasive species removal.

Figure 1.1

Lilly Day of Service Environmental Project Types and Participant Amounts for 2016 in Indianapolis



Note. Total populations noted in parentheses and percentages noted for comparison.

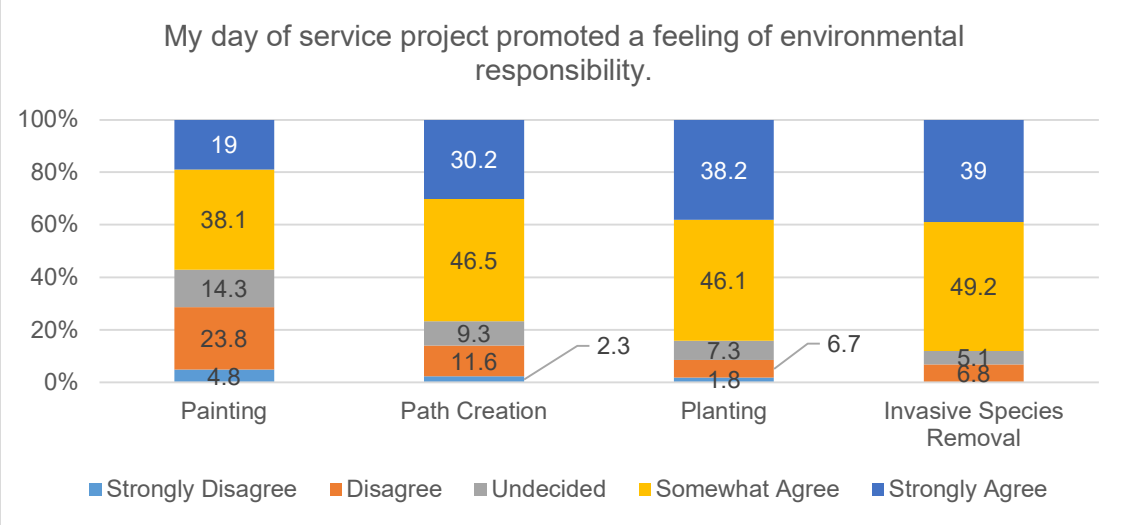
While the latter three project types are intuitive to environmental activities, the first one, "painting," may not be. All the groups who participated in the painting activities were involved either in mural painting or in another project with a community arts organization called Big Car. Big Car is an Indianapolis placemaking art-based nonprofit (Big Car, n.d.). Based on some of the Big Car participants' qualitative data, individuals were painting outside in the natural environment, and were also removing invasive species/weeding. Painting murals has been listed along with planting trees and gardens as a mode of recovery and restoration post-disturbance events (Fisher et al., 2015).

The importance of environmental stewardship projects being offered through Lilly's day of service is apparent as most participants responded they rarely (46.2%) engaged outside of their day of service project in environmental volunteer activities. The day of service project promoted a feeling of environmental responsibility with 82.0% of all group project types responding positively. Reviewing the results of each project type,

invasive species removal had the highest amount of agreement (88.2%) for the environmental responsibility statement with planting, path creation and painting following, respectively (Figure 1.2).

Figure 1.2

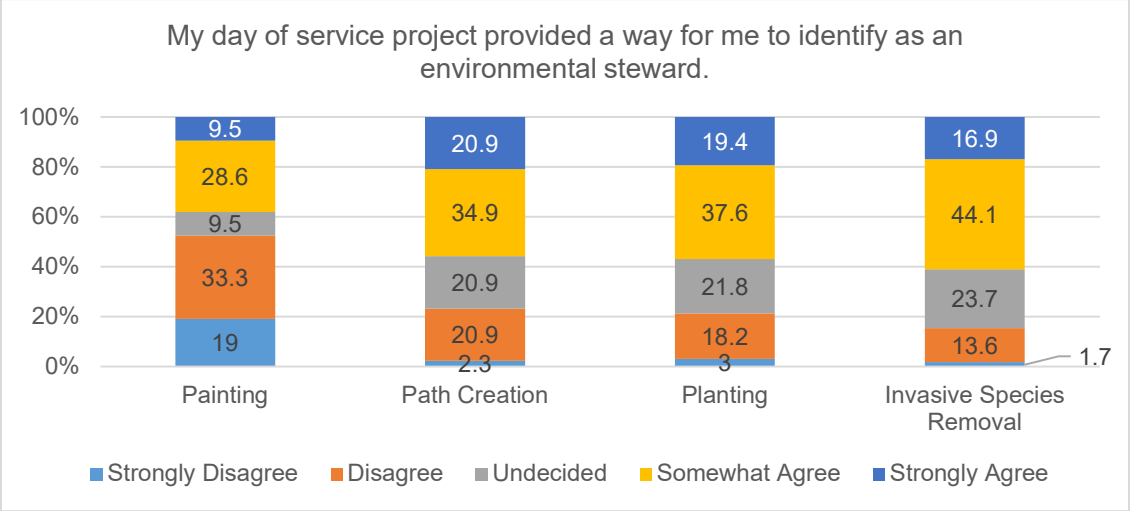
Environmental Responsibility Outcome by Day of Service Environmental Activity



Additionally, over half of the aggregate (56.2%) agreed to some extent that the day of service project provided a way for them to identify as an environmental steward. When results were broken down by project type, invasive species removal had the most positive results (61.0%) for the respondents' project providing a way for them to identify as an environmental steward (Figure 1.3).

Figure 1.3

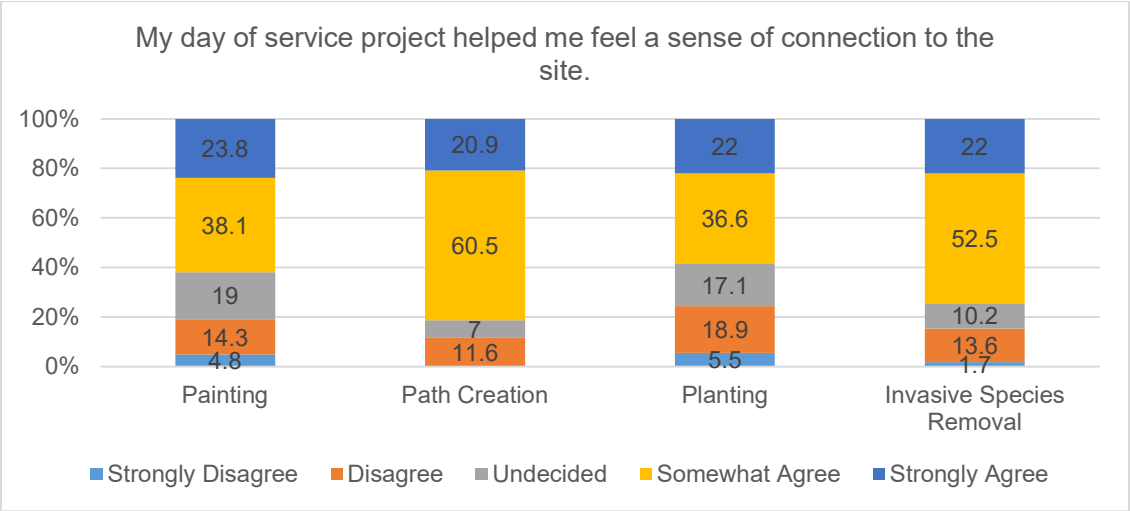
Environmental Steward Identification Outcome by Day of Service Environmental Activity



Most respondents (90.3%) had not participated in a project before at the site or area where their day of service project took place. Despite this, all environmental project types had over half of participants responding affirmatively to feeling a sense of connection to the site due to their activity. The path creation participants had the highest amount at 81.4% (Figure 1.4).

Figure 1.4

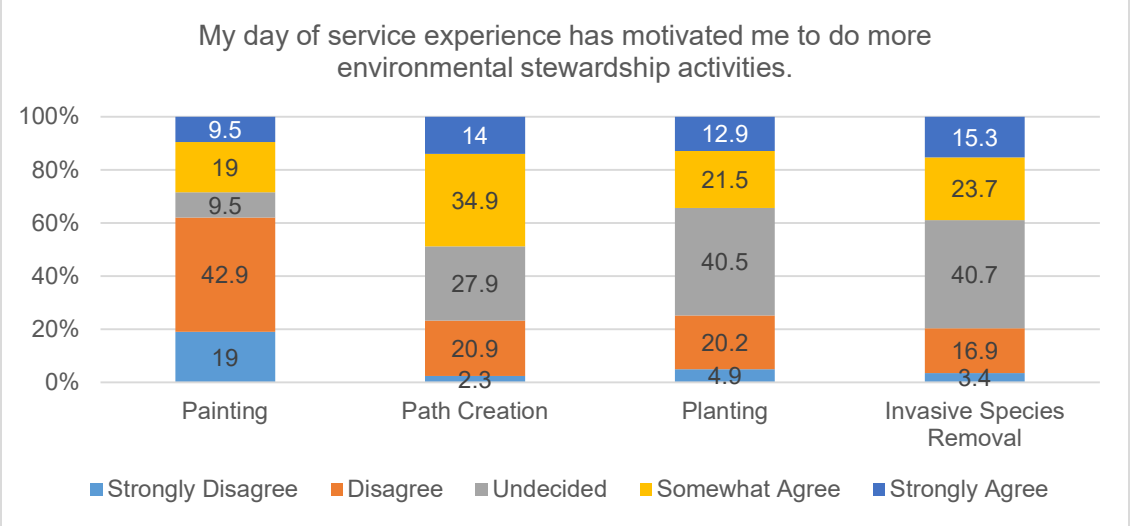
Sense of Connection to Site of Environmental Day of Service Activity



Although invasive species removal had the highest percentage of respondents positively agreeing that their project promoted a feeling of environmental responsibility and provided a way for them to identify as an environmental steward, their motivation to do more environmental stewardship activities mainly fell within the undecided range (40.7%). Yet, participants who performed path creation and felt a sense of connection to the site more than the other project types resulted in the greatest number of volunteers motivated to do more environmental stewardship activities (48.9%) (Figure 1.5).

Figure 1.5

Environmental Stewardship Motivation Resulting from Day of Service Environmental Activity



Dolan et al. (2015) also generalized as to how the 2012 day of service environmental stewardship "helped foster in citizens a sense of place and connection" (p. 323). This outcome of people's attachment to place and stewardship is related to sense of place theory and needs further research.

Clearly, once off large interventions spur connection, but still shows need to provide a mechanism to individuals for being more intentional behind pursuing future

behaviors. The key question is how do we move citizens beyond environmental mindedness for an acute amount of time to creating a more habitual behavior? The larger thesis' argument is that sense of place is a critical component for what inspires environmental attachment and more sustainable action.

Dissertation Structure

Three projects comprised this dissertation. The first project was ethnographic and reviewed multiple families' interviews with a transformative mixed methods approach as it assessed people's culturally relevant conditions and processes, versus main world views (Mertens, 2007), regarding their environmental knowledge and behaviors. The second project consisted of surveying community members who interacted with an environmentally themed art piece and utilized an embedded mixed methods design due to questions requesting different data types (Creswell & Plano Clark, 2011). Lastly, the third project evaluated student results from collegiate-level curriculum through focus groups, surveys, and course observations with each data type pulled together to better describe the same phenomena in a mixed methods triangulation design (Plano Clark & Creswell, 2008). A more in-depth review of each's project content follows in the next section.

The resulting populations from all three studies cultivated a level of studying-up within the research design and outcomes. These populations were the individuals with the resources and means (such as finances, education, etc.) to act (Nader, 1969). Maslow's Hierarchy of Needs (1954) also points that this population would be the most relevant for this type of research as the bottom tiers, such as survival, have to be satisfied before upper tiers like self-actualization can occur. When considering environmental behaviors,

Jain and Kedia (2011) describe environmental capabilities like sustainability as being relevant to the upper tiers.

Projects' Overarching Descriptions

The following studies are important to scholarship as human-environmental relationships have been of great interest across many disciplines and place-based research has been utilized to better understand public attitudes and relationships in the environmental realm (Alam, 2011). Scannell and Gifford (2010a) present that "place attachment contributes to the understanding of pro-environmental behavior" (p. 1) yet also state the findings are inconsistent and research limited. The overall work presented here adds to existing literature and addresses research gaps by providing a compilation of people's environmental perceptions and actions via three different mixed-methods projects.

Each of the projects were designed to analyze people's environmental connections and actions. The first project presented highlights the broad range of factors that affect people's environmental attitudes and actions with data compiled from interviewing families who lived in Indianapolis, Indiana. As Kollmuss and Agyeman (2002) posit:

> …the question of what shapes pro-environmental behavior is such a complex one that it cannot be visualized in one single framework or diagram. Such a diagram with all the factors that shape and influence behavior would be so complicated that it would lose its practicality and probably even its meaning. (p. 248)

The interviews showed aspects of this complexity and importance behind acknowledging the different constituents and their overlap. While several elements and nuances are presented in the first project, sense of place was found to be a major contributing theme for the families researched and became the concept that the proceeding projects focused

on further. For the second project, a survey with a place attachment construct was reviewed on its effect for people's behavioral intentions after interacting with an environmental art installation. The artistic installation promoted visual communication about environmental issues to create a sense of attachment to the waterway, incite curiosity about the environmental theme presented, and educate on both the waterways and environmental issues. The third project considers how sense of place, as constructs of place attachment and place meaning, can be influenced by embedding urban agriculture content and context within a formal educational setting in two different undergraduate courses at Butler University. Synopses with overarching specific aim and research question(s) for each project are as follows:

Project One – Specific Aim:

Extract the Often-Discreet Fundamental Values of People Towards the Natural Environment. In the first project, families who had at least one member who worked for Lilly, a pharmaceutical company, were the sample population for garnering data on environmental awareness and action. A research design utilizing ethnographic methods and prioritization list instruments resulted in rich data on observed and reported behavior. The key question addressed was what determinants are affecting environmental awareness and pro-environmental behaviors?

Project Two - Specific Aim:

Address Indianapolis Community Members' Environmental Perceptions and Awareness. Reconnecting to Our Waterways (ROW) and the daVinci Pursuit are Indianapolis-based entities that have collaborated in identifying artists who create informative environmental artwork. They work together to place these installations

alongside the waterways either temporarily or permanently. Surveys designed to understand individual's environmental behaviors and perceptions of the artwork were administered during two community events as the main method for answering the primary research questions:

- Does the artwork function as a mechanism for place attachment?
- What is the greatest predictor for the art's ability to positively affect people's intentional environmental behaviors?

Project Three - Specific Aim:

Analyze Educational Modes Designed to Encourage Young Adults to Become More Environmentally Conscious and Active Citizens. Undergraduate students at Butler University who enrolled within certain classes participated in course modules designed to integrate sustainable food systems knowledge. These modules utilized the Center for Urban Ecology's Farm and other urban farms to create place-based experiential learning (PBEL) environments through course appropriate research projects. Evaluation of the course modules occurred through course observations, structured focus groups, and surveys. The focus group protocols and survey instruments were designed to assess students on sense of place, civic-mindedness, and scientific literacy.

The central research questions were:

- Can a four to six week-long urban farm PBEL module measurably affect aspects of sense of place?
- Are differences in PBEL module intervention and/or implementation reflected in sense of place outcomes?

- Do students describe an intent to act pro-environmentally as a result of the modules and their changes in sense of place?

Defining Sense of Place

Depending on discipline, the terms sense of place and place attachment are often utilized in a similar manner, and the terms can be arguably interchangeable pending the research and discipline. For example, Žlender and Gemin (2020) specify for the terminology that while environmental psychologists employ place attachment, human geography researchers tend to use sense of place. To highlight the parallels of definitions a synthesized description of place attachment follows that "…the core of most definitions of place attachment identify a positive emotional bond that develops between people and their physical environment" (Alam, 2011, p. 637). Along the same line, a generalized definition for sense of place can be stated as "a complex affective bond between people and a specific location" (Žlender & Gemin, 2020, p. 2). There are also other additional terms researchers have applied that embody similar postulation (A Kudryavtsev et al., 2012). These aspects make generalizing language in a broader context "messy" as Trentelman (2009) notes.

For this research, terms were used as correspondingly as possible to respect already established definitions and ensure sense of place was applied and understood as a multi-component concept. For example, sense of place has been theorized as a combination of constructs, such as place attachment and place meaning (A Kudryavtsev et al., 2012; Semken & Freeman, 2008; Semken et al., 2009; Stedman, 2002, 2003b). The social construction of sense of place is framed through place attachment, while the physical environment's aspects are symbolically attributed via place meaning (A

Kudryavtsev et al., 2012; Stedman, 2003a, 2003b). This research approaches sense of place similar to Solin (2010) and treats sense of place as a multifaceted concept utilizing constructs to simply help with organization when applicable.

Considering the above guidelines, the interviews from Project One and focus groups from Project Three represented a more holistic overview of sense of place with the individuals' stories revealing an intertwining of variables, like place attachment and place meaning, to varying degrees. For Project Two, I reviewed the utility of a survey with what I considered to be more of a place attachment construct because of language usage. While in Project Three, I analyzed surveys with both place attachment and place meaning constructs for sense of place. To guide relevance of outcomes to other research and since the concepts are similar, cited references from sense of place and place attachment extant literature are both utilized within all chapters to highlight parallels, support inquiry, and frame outcomes regarding environmental behavior.

Sense of Place and Environmental Behaviors

Regardless of language employed, evaluating place connection is important as "too many of us in North America have lost the necessary knowledge and love of local places to nurture and sustain healthy human and natural communities" (Edelglass, 2009, p. 71). Edelglass (2009) continues to dissect the remarkable cultural condition that has resulted from place disconnection which includes cessation of community connectedness and ecosystem deterioration. This isolation and lack of ability to identify with our resources' origins creates a detachment to our actions' consequences (Edelglass, 2009). Wendell Berry (2001) states that generally people disregard their sense of responsibility and lack gratitude towards the resources that sustain them. "Most people appear to

assume that when they have paid their money for these things they have entirely met their obligations" (Berry, 2001, p. 40). As Halpenny (2010) posits, environmental awareness about problems has increased yet people fail to behave in manners that would reduce their environmental impact.

Achieving larger system concepts such as sustainable development necessitates application through local practices to be pursued as community needs and resources differ (Maida, 2007). Sense of place is a multifaceted concept that could be instrumental to better guide what functions to encourage environmental identity and behavior. The relationships between pro-environmental behaviors and environmental awareness and knowledge have been assessed via numerous theoretical frameworks and all studies have been found to lack a definitive answer, yet some have circumstantial validity (Kollmuss & Agyeman, 2002). Thus, understanding the proclivity of individuals and groups towards environmental knowledge, awareness, and stewardship must be achieved in multiple ways and consider a multitude of factors.

As such, sense of place has been suggested as a theory for people's engagement in environmental stewardship and pro-environmental behaviors (Chapin et al., 2011). Place researchers' have found that sense of place aspects influence pro-environmental intentions and behaviors (Halpenny, 2010; A Kudryavtsev et al., 2012; Ramkissoon et al., 2013; Scannell & Gifford, 2010b, 2013; Stedman, 2002; Vaske & Kobrin, 2001; Walker & Chapman, 2003). Experiences that help to form attachment include behavioral commitments, social relationships, and people's emotions and thoughts regarding a physical setting (Bricker & Kerstetter, 2002; Jorgensen & Stedman, 2006).

Analyses of place-concerning behaviors indicate sense of place as a major influence (Halpenny, 2010; Žlender & Gemin, 2020). Place attachment outcomes were an important factor in predicting environmental intentions based on research on visitors to Point Pelee National Park (Halpenny, 2010) and Dandenong Ranges National Park (Ramkissoon et al., 2013). For youth interventions, Vaske and Kobrin (2001) found that environmental behavior was motivated by encouraged attachment to a natural setting, with Kudryavtsev, Krasny, et al. (2012) showing that increased ecological place meaning may help perception regarding the significance of nature in an urban setting.

Place attachment was also found to better explain variance in attitude towards a hydropower development in a Norwegian rural community better than sociodemographic variables (Vorkinn & Riese, 2001). In addition, Scannell and Gifford (2010b) found that "self-reported pro-environmental behavior is more frequent among residents who are attached to their local areas," (p. 294) and more specifically that natural place attachment was a predictor of pro-environmental behaviors in the two towns researched. The research performed for the following projects considered the physical, ecological aspects of place with a behavioral-based focus per Scannell and Gifford's (2010a) tripartite organizing framework for place attachment.

Sense of Place Broader Importance

While each project had its own application to assess sense of place and environmental behaviors, the larger relevance of better understanding this multi-dimensional concept varies greatly pending interest and is as diverse as the theory. For example, sense of place has been researched to better understand visitor satisfaction in nature-based tourism, such as national parks, for conditions that strengthen future

visitation (Ramkissoon & Mavondo, 2015). While Kyle et al. (2004) research cites sense of place as being important to discern better public land and resource management in tandem with stakeholders. More specifically, sense of place has been utilized to frame inquiries and research regarding peri-urban open spaces and land-use planning (Žlender & Gemin, 2020). Žlender and Gemin (2020) argue that "Sense of place (SOP) is one of the place concepts which offers opportunities to understand the types of spaces people would prefer and frequent, which is crucial for inclusive planning and policy-making" (p. 1).

In addition, sense of place as a locality-based concept promotes a comprehensive mode for creating larger-scale actions. For example, in regards to environmental behaviors, Halpenny (2010) found that both place-specific and general pro-environmental behavior intentions' had similar survey outcomes with sense of place being a good predictor for either. These results reveal that individuals may utilize a local lens to influence their overall environmental behaviors, promoting more inclusive change to extensive environmental issues.

Current and future global environmental challenges call for proactive and productive citizens who understand and will respond to these issues accordingly. Yet, how, if at all, do groups and individuals learn about environmental situations and become engaged? Not everyone is involved in stewardship projects and some people have no knowledge of environmental concerns, a topic many nonprofits, government agencies, scientists, active environmental stewards, and others would like to better understand for resources, research, and educational purposes of initiatives. To assist in this endeavor, an integral piece presented by the following research is sense of place.

Chapter Two

Project One – Pressing Priorities: Identifying Circumstances for People to Place the Environment First

Introduction

Human welfare and ecosystem capacity are mutually reliant on one another, however, lack of knowledge around this interdependence creates an illusion of false competition between the two (Chapin et al., 2011; Kareiva et al., 2008). The environmentalist's paradox of "How is it that human well-being continues to improve as ecosystem services decline?" (Raudsepp-Hearne et al., 2010, p. 577) articulates the nature of this perceived competition (Filippelli, 2018). Yet, this prosperity of human well-being cannot be in competition with nature because human welfare is nature dependent (Chapin et al., 2011).

Does this lack of awareness around human well-being's relationship to ecological systems denote a lack of naturalist intelligence within society? The notion of "naturalist intelligence" comes from developmental psychologist Howard Gardner's proposed multiple intelligences theory. "Naturalist intelligence" pertains to people's capacity to understand and recognize the natural world and its components, such as different animals and their species. However, one argument proposed by Gardner is that within the current, developed world, most people do not rely on naturalist intelligence in an ecological capacity due to our built environment (Gardner, 2008). Naturalist intelligence is now deployed differently in a more materialistic manner; thus he suggests that, "…our entire consumer culture is based on the naturalist intelligence" (Gardner, 2008, p. 19). This

consumeristic manner of utilizing our naturalist intelligence underlines an inherent exacerbation of humans' alienation from nature and unsustainable resource usage.

People, particularly in urban areas, are often thought of as separate from the environment because of the dominance of the so-called "built environment" surrounding them; yet they are an integral piece of environmental systems. Socially normative lifestyles and living conditions, along with aspirations towards higher living standards, shape how society contributes to negatively impactful environmental issues (Jensen, 2002). Forms of salient influences that cause people to adjust their behaviors and to take action towards improving their ecological footprint versus increasing natural resource consumption are important to understand as they highlight what factors can point people toward creating a more sustainable future.

Environmental Behavior Motivation and Importance

Developing environmental action in all societal levels is complex (Kollmuss & Agyeman, 2002). Kollmuss and Agyeman (2002) reviewed a number of theoretical frameworks used to assess the disconnect between people understanding environmental concerns and acting environmentally consciously due to as Halpenny (2010) states "…most [people] fail to make choices that benefit the environment or at least minimize negative environmental impacts" (p. 409). While no avenue to environmental stewardship has been deemed definitive (Kollmuss & Agyeman, 2002), research framing what motivated people who identify as environmentalists does provide thematic topics for routes of saliency (Chawla, 1998, 1999).

Chawla (1998, 1999) researched and assessed through samples that encompassed mainly environmentalists what motivated people to protect the environment. The term

"environmentalist," in the context of this research, describes an individual who does more than the normative actions that are readily accessible and instead, commits their career or free time to addressing larger environmental issues and raising awareness. In Chawla's (1998) review on multiple research projects that addressed environmentally committed participants' influences in their decision towards environmental activism, interests, or careers, she identified several recurring responses. The prevalent influences Chawla (1998) listed from her meta-analysis were "positive experiences in natural areas, adult role models, environmental organizations, education, negative experiences of environmental degradation, books and other media, and on-the-job experience" (p. 16). The different research projects' participants included, but were not limited to, environmental conservation organizations' officers and staff (Tanner, 1980), British environmental educators (Palmer, 1993), New Hampshire coast volunteer marine docents (Peters-Grant, 1986), and El Salvadoran environmental professionals (Sward, 1996).

Chawla (1999) also found in her research on environmentalists from two countries, Norway and United States, that formative childhood experiences were the main element in how interviewees explained the origins of their environmental commitment. However, as she notes, "…these studies have lacked comparison groups, they do not show that these antecedents distinguish environmentally committed people from the general public" (Chawla, 1999, p. 15).

In regards to the general public's perceptions, frequency data from Gallup's annual environment poll in 2018 showed that the percentage of the Americans who identify as environmentalists was down to 42% from an average of 76% in the late 1980s and early 1990s (Gallup, 2019). In addition, the 2018 poll shows that "Americans are

generally less positive about the quality of the environment than they have been in years, and are convinced that it is getting worse rather than better" (Newport, 2018, Bottom Line section, para. 1).

These public perceptions are verified and supported by the fact that climate change and resulting increases in detrimental effects are detailed in recent scientific reports, such as the Fourth National Climate Assessment (USGCRP, 2018), which highlights the importance of an ecologically knowledgeable and engaged society. The Intergovernmental Panel on Climate Change (IPCC) provides evidence of the urgency of this need by reporting with high confidence that in order to circumvent a global warming temperature overshoot of 1.5°C and dependency on large-scale deployment of carbon dioxide removal in the future "can only be achieved if global CO_2 emissions start to decline well before 2030" (IPCC, 2018, p. 20). However, pervading neologisms reveal an undermining of people's perceptions and abilities to be able to identify with and proactively participate in being environmental stewards. These coined expressions include nature-deficit disorder which refers to people's alienation from nature (particularly children) (Louv, 2008) and solastalgia which is a psychological condition pertaining to the distress caused by place-based environmental degradation (Albrecht, 2011).

Multitudes of factors hinder environmentally responsible behavior and are made even more complex due to variance in challenges' perceived importance. For example, Blake (1999) discussed three codes utilized to summarize responses from 163 individuals regarding obstacles to specific environmental actions in the United Kingdom. These categories included individuality, responsibility, and practicality. These three terms

covered a range of barriers such as lack of interest and laziness for individuality, feelings of powerlessness and lack of efficacy for responsibility, and lack of time and lack of facilities for practicality (Blake, 1999). With a typical caveat being "Which factors are important in any one case will vary for different individuals, environmental actions, and social or institutional constraints." (Blake, 1999, p. 266). While Blake's model was found useful in Kollmuss and Agyeman's (2002) review on multiple theoretical models, Blake (1999) was critiqued for not incorporating additional variables, including social factors such as cultural norms. The following research assessed the richness of factors that influence people's environmental awareness and action while trying to maintain levels of priority through quantification activities and assessing how many family members found saliency in similar topics. This mode of inquiry was to promote the identification of essential methods for overcoming blockages towards a more environmentally educated and responsible society.

Purview of Project

Research on a subpopulation of Indianapolis residents who all work for the same science-based industry, Lilly, was undertaken to achieve a better understanding of aspects that helped or hindered environmental knowledge processes and stewardship. According to Maslow's Hierarchy of Needs (1954), the bottom tiers of survival and safety needs must be fulfilled prior to satisfying the upper tiers of belongingness and love needs, esteem needs, and self-actualization. Environmental initiatives, such as sustainability, are viewed as being part of the upper tiers (Jain & Kedia, 2011). Thus, populations who have the ability through jobs and social status to fulfill those bottom needs have been

prioritized for the purpose of this research as they have the means and ability to choose to participate in the upper tiers.

This research encompassed a transformative mixed methods approach with a studying-up framework to create a rich data set, providing information on culturally relevant conditions and processes that citizens utilize (Mertens, 2007) who have the resources to assess, decide, and act (Nader, 1969) regarding environmental situations. The following research addresses gaps in extant literature concerning less environmentally active citizens' lives within a family context. More specifically, as fewer people are identifying as environmentalists what determinants are affecting environmental awareness and pro-environmental behaviors?

Methods

Recruitment Aspects and Interview Schedule

In 2015, Lilly employees were contacted by email to gauge their interest in participating in a 2-year study along with their immediate family. The research goal was to understand how people in Indianapolis think about earth sciences and their waterways, as well as capture over time how ideas might change. After they expressed a desire to participate in the study, a pre-interview was scheduled. These pre-interviews allowed participants to finalize their participation in the study by going through appropriate institutional review board (IRB) documentation and details of the project's intent.

Eight families participated who all had at least one family member who worked at Lilly. The families also lived outside of the Indianapolis' inner city, but within the metropolitan area. The families were predominantly white and highly educated with approximately half of the parents holding post graduate degrees. These variables resulted

in a relatively homogenous sample of participants who possessed similarities in terms of their general demographics. The study's research design provided a longitudinal framework via semi-structured interviews and started in June 2015 and ended September 2017. By September 2017, all families were given an exit interview.

Throughout the duration of the interviews, families were given incentives for their participation. Incentives included an iPad and four $50 Amazon gift cards per family. The iPad was to provide families with a means of creating storage folders with pictures they would like to share with others, using applications such as Dropbox.

Families were encouraged to choose their own interview locations. Communications occurred predominantly by email, but some families preferred to text and call when scheduling their interviews. Audio recorders were used at every interview and visual documentation, such as pictures and/or video recordings, were utilized when appropriate. The level of interaction with the families was high; thus, researchers took written notes when possible. Researchers engaged with the families through conversations, participation in activities, and observations.

Interviews' Structure

During this series of semi-structured interviews, researchers spoke with participants about their level of environmental knowledge and engagement in environmental stewardship. Including the pre-interview, a total of ten interviews were suggested within the procedures of the IRB paperwork for each family. As all families had at least one immediate member who worked for Lilly, and Lilly has one of the largest days of service for Indianapolis with project types including environmental stewardship (Lilly, 2017), interviews were initially structured to fall pre- and post-day of service.

Other interviews were scheduled in between this annual date to occasionally touch base with the families. For example, the two interviews following the pre-interview were scheduled pre- and post- the dates of Lilly's annual day of service. The researchers inquired about any pre-knowledge on the day of service activity and then asked about the activity post-occurrence. After these interviews, the lead interviewer left the project and outcomes called for a different approach with Lilly's day of service interview structure not needing utilized and more loosely adhered to for the last four interviews.

The subsequent interviews were then led at my direction. The first one (fourth family interview) contained questions pertaining to the families' community perceptions but was more to realign dynamics and comfort after a change in researchers. The next two interviews (fifth and sixth) utilized prioritization lists as instruments. See Appendix A for Instruments: Issues and Solutions Prioritization Lists. These lists were ranked during the interviews by individuals in the family who wanted to participate.

The first prioritization list interview (fifth interview) concentrated on environmental and waterway issues that were based on an urban water resource handbook focused on Indianapolis waterways (Danoff-Burg, 2016). A total of nine variables were collected and consolidated from this resource and were provided with definitions. Some of the variables' definitions were directly cited from environmental entities or the Merriam-Webster dictionary to try to ensure consistent and accessible language usage regardless of participant's background. The variables included brownfields (Environmental Protection Agency, 2016a), chemical pollutants, combined sewer overflows, groundwater pollution (The Groundwater Foundation, 2016), invasive species (National Wildlife Federation, 2016), litter (Merriam-Webster, 2016a), urbanization

(Merriam-Webster, 2016c), urban heat island effect (Environmental Protection Agency, 2016b), and urban water engineering. The second prioritization list interview (sixth interview) focused on environmental issues' potential solutions, with some identified via the families in their issues' prioritization list interview. This list also had a slight target on waterways with the variables of: education, incentives, legislation, riparian habitat restoration (Eubanks, 2004; Merriam-Webster, 2016b), environmental stewardship, urban water engineering, and reduce-reuse-recycle-compost (as one).

Environmental issues and solutions as a whole are very broad, so an 'Other' option was provided for both lists. The 'Other' option was blank and meant for participants to fill in with any ideas they had, if they were so inclined. Thus, loosely targeting waterway issues was meant to help maintain a level of focus in a particular area, and the semi-structured format and 'Other' option allowed the conversation to unfold in any direction the participants wished to take.

For both prioritization lists, the researchers allowed the participants enough time to rank their answers individually. Then, when everyone had completed their ranking of the list, as well as adding any additional thoughts to the 'Other' option, the entire group unpacked the reasons why they ranked their list as they did. This allowed for their own perceptions to be addressed versus pressure to rank as a group. The children could participate if interested. If they were not interested in the prioritization lists, then researchers had paper, markers, and crayons on hand to entice the children to participate in another activity. During the issues list interview, the children were requested to draw their favorite thing to do outside and their least favorite thing to do outside. During the solutions list interview, the children were asked to draw what they thought hurt the

environment and what they thought helped the environment. The children were given time to discuss their drawings and why they drew what they did. The drawing activities informed on what the children do when outside and what comes to mind when discussing environmental topics.

The interview approach resulted in a rich cache of data. The number of interviews allowed for the researchers to familiarize themselves with the families and build trust. Over time, these meetings led to more dynamic exchanges among and between the researchers and families. The two later interviews where the prioritization lists occurred were further analyzed and reviewed due to more tangible results, outcomes, and rapport.

Interview Analysis

The rank-order outcomes of the variables from both prioritization list activities were aggregated per all participants' responses. For qualitative analysis, the two prioritization lists' interviews were transcribed and thematically coded (Braun & Clark, 2006). Established codes from Chawla (1999) and emergent codes were utilized to organize transcription data. Emergent coding provided a deeper analysis of what the families found as both salient influences and hindrances to their environmental knowledge, awareness, and action. Emergent coding was also useful as the research encompassed a more general populace and less environmentally active individuals along with a different implementation for data collection via prioritization lists. The mixed methods approach of using quantitative research activities provided a framework for qualitative semi-structured interviews and created a rich data set.

Results

Interview Participation

For the approximate two-year time frame, June 2015 to September 2017, eight families signed-up to participate in the research project. The interview locations ranged from families' homes to places within Indianapolis and outside the city. The interview locale was always chosen by the participating family. All eight participated in a pre-interview, with two families having their pre-interview around the same time as the second interview for everyone else, and all eight participated in the exit interview, but only five participated in all seven interviews (Table 2.1).

Table 2.1

Overview of Number of Families and Interview Participation

Family Participation	Number of Participating Families	Number of Interviews
In all 7 interviews	5	35
In 6 interviews	2	12
In 5 interviews	1	5
TOTAL	8	52

The families received incentives for their time, but due to their socio-economic status these did not appear to be determining factors for the families' participation. For example, the iPad was intended to provide a resource for documenting their environmental interactions, yet most of the families never created the requested sharable online account and only a couple of families showed us photos they took over the next couple of interviews. All families seemed to already have this technology/device and the iPad for them was extraneous to what they already owned. Also, while the families always expressed gratitude upon receiving the gift cards, this did not seem to determine

whether meetings did or did not happen. Interview details would be decided upon without any mention of the gift card, and the families would act surprised upon receipt of the gift card.

The fifth and sixth interviews which utilized the prioritization lists were transcribed and thematically analyzed. These interviews were chosen as the basis of the following research content as they contained the most viable and direct information and perceptions from the families. The relationships between researchers and families were also more established and trustful, creating an open-exchange dynamic.

Prioritization Lists

Overview. Prioritization list discussions provided rich data for coding analysis. The term 'less environmentally active individuals' in this research pertained to the fact that none of the family members had careers centered on the environment nor did they show an externally high degree of environmental activism. Yet, many of the families did perform basic environmentally responsible actions with behaviors such as recycling and not littering/picking-up litter noted within conversations and through direct observation. Thus, this was not an environmentally apathetic population.

The interviews allowed for the family members to share their individual priority outcomes during family group discussion. The participants were requested to share why they prioritized the way they did, which allowed for recall on prior knowledge or experiences with the listed variables. Since the interviews were semi-structured, the conversations would often go much broader or to topics of interest, providing rich data on people's environmental awareness, knowledge, and actions. While prioritization lists allowed for people to openly discuss their perceptions, experiences, and knowledge

around the listed variables, at times there was no prior knowledge or understanding of terms before reading the priority lists' definition or sometimes even after reading the definition.

Rankings and Drawings. When the prioritization lists were given, the participants were the parents and older children. The older participating children's ages ranged from mid-teens to mid-twenties. The younger children preferred to draw. Results for the prioritization lists for each family participant are provided in Appendix A in Table A1 for issue topics and Table A2 for solution topics. The resulting aggregated rank-order outcomes are reported below in Table 2.2 for issues and Table 2.3 for solutions. The 'Other' option created space for conversation on environmental issues and solutions that the individuals considered as important, as well as necessary for the conversation (see Appendix A: Table A3). Some of the family members even ranked their 'Other' option for the issues list providing a context as to how important they saw it in comparison to the listed topics. These 'Other' rankings were not considered for the aggregate outcomes and rankings were adjusted accordingly.

Table 2.2

Compiled Data Representing Finalized Prioritization List Order for Issues

Issue Ranking (From Highest to Lowest Priority)	Aggregate Rank Outcome (n = 21)
1. Chemical pollutants	56
2. Groundwater pollution	58
3. Combined sewer overflows	86
4. Litter	106
5. Brownfields	107
6. Invasive species	119
7. Urbanization	127
8. Urban heat island effect	138
9. Urban water engineering	148

Urban water engineering was provided for both lists as this variable had been the most polarizing for some participants who saw it as a solution versus an issue. As one participant mentioned during the issues list interview, "…some of these others are always bad, while urban water engineering doesn't necessarily have to be." Regardless, urban water engineering was lowest priority for both lists when data was aggregated.

Table 2.3

Compiled Data Representing Finalized Prioritization List Order for Solutions

Solution Ranking (From Highest to Lowest Priority)	Aggregate Rank Outcome (n = 19)
1. Education	56
2. Reduce, reuse, recycle, & composting	57
3. Environmental stewardship	64
4. Legislation	74
5. Incentives	80
6. Riparian Habitat Restoration	99
7. Urban Water Engineering	102

While all the children were given the opportunity to participate in the prioritization lists, the younger ones preferred to engage in the drawing activity. During the issues list interview, the children were requested to draw their favorite things to do outside and their least favorite things to do outside (Table 2.4). A number in parenthesis beside the activity denotes how many children drew that topic. More drawings resulted about the children's favorite thing to do outside, with some of them not drawing anything for their least favorite thing to do outside. Two of the families with younger children did not partake in drawing during the issues list interview as their interview locations were at parks and the children wanted to play.

Table 2.4

List of Topics Children Drew for Outside Activities

Favorite Thing to Do Outside	Least Favorite Thing to Do Outside
Camp outside when it's warm	Being hot
Tubing	Camp outside when it is cold
Treehouse	Walking
Holiday World	Hiking
Swinging	
Climbing trees (2)	
Ride bike (2)	
Playing basketball w/ Dad	
Jumping rope	

During the solutions list interview, the children were asked to draw what they thought hurt the environment and what they thought helped the environment (Table 2.5). Only one family with young children who had participated in the issues list interview and drawing activity were not available for this interview. The numbers in parenthesis beside the listed item pertained to how many children drew a version of that topic.

Table 2.5

List of Topics Children Drew for Environmental Solutions and Problems

What Helps the Environment?	What Hurts the Environment?
Water, watering plants	Dryness, arid - no water for vegetation
Planting (2)	Littering (3)
Picking up trash (3)	Oil/chemical spill (3)
DNR	Litter with toxic fumes
Clean ocean habitat	
Clean environment	
Don't drive trucks	

Environmental Hindrances

During family discussions around environmental behavior and perceptions, other topics regarding hindrances were revealed. The following sections summarize the

dominant issues families either discussed or displayed as problematic to their understanding and as impediments to their environmental conduct.

Jargon. The issues prioritization list was the most problematic with families considering the terminology as jargon, highlighting that definitions provided from agencies did not necessarily mean the language was accessible. The solutions list, while not perceived as jargony, also revealed language obstacles. For example, with participants from six of the eight families I found that "riparian habitat restoration" from the solutions prioritization list was also not well understood and most of the families had never heard of this term. This outcome was of particular interest as riparian habitat restoration was an environmental activity that most, if not all, family members who worked for Lilly had participated in at least once during a work service day. As one participant who helped to organize and manage Lilly's days of service realized:

> …kind of goes back to the global day of service purpose, removing invasive species. I actually never heard it called that before, but reading the definition seems to be the whole thing you can do to the invasive species to allow that natural growth.

Big Business Versus Individual Contributions. While big business/corporations and their lack of sustainable behavior came up as a topic for multiple families when considering legislation, this theme was also noticed in other conversations, such as brownfields. Regardless of when this topic would surface, an overlying frustration existed towards the level of environmental degradation corporations have inflicted without necessary ramifications compared to what an individual person could impose. One mother of four who lives close to two different brownfields created by larger businesses exasperatedly discussed, "No, it's just ridiculous…we're harping on little kids to make sure they recycle, yet you [corporation who created nearby brownfield] can

destroy a multi-block, multi-acre area." An adult child in her mid-twenties colorfully described her perceptions as an individual being held accountable for the state of the environment saying:

> 'Cause then it would be like, 'oh, all you guys need to do is make sure you don't throw shit in the river.' Well, no, I need to make sure that BP doesn't spill all their oil in the Gulf of Mexico again. Like, fuck you, guys! It's not my God damn fault. You know what I mean?

The predominant reasoning given by the families for why they believed the corporations behaved in an unsustainable manner was reducible to simple greed. The same young lady from the previous quote explained her perceptions as to how this greed has affected society on a more systemic level:

> To my mind, this is all just a product of capitalism. I mean when people have an outlook on the world where capitalism is the overriding belief, then we're going to continue to destroy the plant because it's all about money and profit. And unless you put some stopgap measure in place that says if you do this shit, then this going to happen – then people are going to continue to do whatever makes the most money.

Culture of Waste/Neglect of Resources. Over half of the families brought up in some capacity the high level of waste we generate due to excessive consumption rates and the different obstacles towards decreasing resource expenditure and waste production. A couple of families whose parents were the oldest participants spoke about how they have noticed how consumerism has increased since their youth and a transition into more of a throw-away society.

One thematic topic from the families was that lack of appropriate resources for environmental actions maintained a higher waste culture. For example, municipality limitations for recycling was one issue. Problems included lack of private and public recycling access. Many of the families recycled at home, but they struggled with the

smaller volume container provided for recycling than for their trash, as well as lower collection frequency. One family confessed to illegally recycling as they had recently moved and had taken the recycling bin from their original house to their new home so that they could have two bins. Two of the families admitted that when their recycling bins filled-up, they threw things into their trash receptacles instead. Another family was observed during an interview at a park throwing away their recyclables once they realized there were no recycling containers.

The above outcomes underlined how when limited accessibility prevailed a negative alternative was chosen. One family's dad described these types of issues as burdens, "And, when things become burdens like that, they tend not to become adopted, because they've got a negative impact for trying to do something that's good." However, another family challenged these types of behaviors as people simply being lazy, particularly through their adult son and his partner who did not recycle. The couple attempted to justify their behaviors because their apartment complex did not support recycling and required them to drop their materials off elsewhere.

Who Is the Trustworthy Authority? Another issue thematically noted was that while information is more accessible due to our technological advances, at least half of the families were skeptical of the media as a reliable source of information. One mom speaking to the challenge of her children using iPads in school and searching via Google and Yahoo to find information mentioned, "You have to vet all the information you get to make sure they're from a reliable source." Another family's mother shared her perception that for the sake of a good story, the media does not always present scientific facts

adding, “You always have to really step back and make sure you have all the facts before really listening to the media.”

Also, lack of adequate information from local resources at the civilian level created issues in knowledge acquisition on environmental topics, as well as potentially discrediting issues. For example, the family who lived off Geist reservoir were quite knowledgeable about invasive species that were problematic around their home. However, the father spoke about how there was a lot of anxiety around the zebra mussels contaminating the reservoir, but “now they’re there, but they’re kind of in balance – it doesn’t seem to be quite the catastrophe that everybody was worried about.” His hesitancy to believe in another environmental issue was noticeable later in the interview when he was informed about combined sewer overflows and the federal mandate for Indianapolis to clean up their waterways. He explained that he thought people got a little too excited about regulations sometimes, and that he would like to see the same data that the Environmental Protection Agency reviewed against the water standards. While doubt noticeably created awareness barriers, so did implicit trust in facilities and authorities’ ability to provide a safe environment.

A few families spoke about trusting that adherence to standard regulations were occurring and that appropriate entities provided enough monitoring and enforcing. For example, as a mother of three expressed regarding the problems presented by combined sewer overflows, “…our water treatment plants for the most part - again, it’s that inherent trust, I hope they never break that – they’re pretty good.” When her husband informed her that, “Yeah, but the problem is that when it rains really heavy, it completely overloads those water treatment plants.” After they discussed this issue and she realized

that the combined sewer water flowed back into the waterways after a rain event, she wanted to increase her answer's priority, "Okay, well maybe that's a little higher on my list."

Cost Inhibition. Five of the families mentioned recycling costs as problematic as one mother of three explained:

> One of the main topics I had was there's still a lot of counties, townships, around here that charge people to recycle. Which if you want people to recycle, that's like the worst way to do it. Especially in times like this – that's going to be the first thing that's cut if they have a $15 month recycling bill.

At home recycling costs were not the only financial blocks listed towards more sustainable behaviors.

Another topic covered associated with sustainable behaviors that were considered cost prohibitive were increased prices for more eco-friendly products. One family in particular discussed their price points for making their home more energy efficient as they had implemented the changes they could afford such as light blocking curtains, ceiling fans in all rooms, and new windows. As the parents of four spoke about the costs and/or length of time to make the financial investment back for larger transformations such as solar panels, the dad spoke to the crux of the situation for what their alternative choice was, "And, so what, our only options are fossil fuels." A similar thread was found within viewpoints on transportation due to price points on hybrid vehicles, with a more financially feasibly option being considered as gas-powered vehicles. As a family member who had recently bought a hybrid pointed out, "cause right now you save money on gas, but you pay more for the privilege to buy a hybrid vehicle. So, people really want to have to do it, cause you don't always profit from it."

While the individual might not financially profit from making sustainable decisions, especially when buying eco-friendly products, one early college-aged daughter pointed out, "They have organic everything now, and may be more expensive, but it's better for the earth and for us, our drinking water, and everything." However, as her dad stated during the solutions priority list interview, "…that's not on here - is just simple economics…If you're just trying to live to your next meal to eat, take care of your kids, and have a roof over your head, the river's not as important, you know?" Regarding this economic disparity, a mother of three adult children posed the question:

> People who are poor in this country don't have the opportunity…They can't justify buying a reusable bag to take to the grocery store because it's like 'I barely have enough money to buy my food and pay rent.' So, how can you tell that person that they have to reduce, reuse, and recycle?

Perceptions on Effectiveness of Solution List Variables

The solutions prioritization list activity was given to the families after the issue prioritization list interview. Some solutions variables were placed on the instrument due to being mentioned by multiple families during the issues list interviews. Not all solutions variables received the same amount of attention by the families. The most frequently discussed and most polarizing variables are presented below, along with a discussion of why or why not families considered these solutions as avenues for environmental problem-solving.

Education. Education ranked as the number one solution variable when considering all participating family members priority rankings together. Half of the families had members who chose education as their top choice reasoning that people need to be informed before they can take action or change their actions. Also, the families had different approaches and perceptions towards what would be the best and most effective

mode for education. For passive learning suggestions, one family mentioned more fact-based messaging, “remove the rhetoric and provide scientific proof of impact.” As the dad of this family stated, “I don’t take action on things unless I am educated about them.” However, another couple of families’ members discussed how they suspected that people knew more about environmental issues, but still maintained poor behaviors.

One family with ages ranging from early twenties to mid-twenties for their adult children and one partner along with parents in their fifties considered a method of utilizing visuals to communicate impact. They discussed this in a couple of different capacities with one mode being to visualize effects such as the dad had seen at his work, “So, down at work they have these big plexi-glass like boxes and they’re filled with trash. And this represents the trash that could have been recycled, it’s maybe a month…” The other visual mode considered was art. The young, adult couple who were part of this family talked about this concept via the art exhibit Washed Ashore: Art to Save the Sea they saw in Washington, D.C. The exhibit promotes knowledge around waterway plastic pollution with an intent to promote consumeristic changes by taking plastic trash from the ocean and creating ocean life sculptures (WashedAshore.org, 2019). As the son’s partner relayed, “Definitely makes me think again if I see some trash or somebody throws some trash in a lake, makes me think more.”

Environmental Stewardship. Environmental stewardship as a variable ranked overall as third priority. Reduce, reuse, recycling, and composting and riparian habitat restoration as solution variables were categorized by the families as approaches to environmental stewardship. Two members of different families explicitly discussed the act of performing environmental stewardship as a motivational learning avenue to salient

environmental education. However, not many families participated in environmental stewardship activities on a constant basis. A couple of families were noted to maintain consistent, volunteer behaviors of environmental stewardship and were focused on the cleanliness of their neighborhoods. Environmental stewardship as a whole was viewed as a finality both in action and outcome to addressing other listed variables. As stated by one family's adult daughter, "…you're not going to get people to be Environmental Stewards unless you have the Education, the Legislation, I mean the – this [Environmental Stewardship] is the last part of the waterfall of all the rest of them."

Legislation. Legislation was perceived as positive when used as a way to hold people and companies accountable. Families considered legislation a mode of forcing change because as one mother put it, "some people won't change unless you make them." At least half of the families viewed government legislation as an approach to better conform corporations. The families discussed how they viewed corporations as 'knowing' what they are doing but choosing not to do what is environmentally sustainable. This was best highlighted through the description of why an early twenties aged son placed legislation as his number one solution:

> I'm thinking that when it comes to the real issues that we have with environmental issues, it's primarily corporations and not individual people. And corporations cannot be assumed to act morally. Educating won't help because they will act in a way that is most ethical for their stock – like stockholders. So that's why legislation is my number one.

Some families were divided on if they thought legislation was a solution or not, while others were opposed to legislation as a solution. The main issue of legislation being considered a solution was due to varying degrees of ineffectiveness, particularly in implementation abilities. One family's mom added 'Focus on tracking and enforcing the

regulations on industry that pollute our waterways so much faster than any single resident is' as an Other option underscoring that existing legislation needs better execution. Some of these family members also wanted to see more grassroots, people power initiatives versus increased governmental control.

Incentives. Incentivizing environmentally responsible behavior was regarded both negatively and positively for motivating action. Incentives were often viewed as a form of bribery. Some family members explicitly stated they believed bribery worked while others were not open to this approach.

Family members who viewed incentives as solutions credited incentivizing sustainable actions to promote tangible returns and habits. Incentives were perceived to be effective when people identified that the behavior and action were worth the time and effort, either in financial compensation, non-monetary perks, and/or recognition. Financial compensation examples given were turning in recycling for money and tax incentives on personal and corporate levels. One family in particular spoke to their views on non-monetary perks that ranged from premium parking spots at work since they drove a hybrid and being offered food for volunteering. A couple of different families' members spoke to being recognized for their work as an incentive. A father of three adult children explains this perception with an example of a public event where Indianapolis' Deputy Mayor spoke about the importance of an environmental initiative the father was involved in, "… it is important to get that feedback – that this is not only an individual exercise, this is also exercising civic responsibility, right? And having someone there to say, 'You guys are doing a great job' was a nice incentive."

One caveat for differing incentive styles highlighted by this same person's family was that modes of motivation would not work for everyone in the same way. They described people as not incentivized by the same thing, making it difficult to pinpoint the most tangible and action provoking method. Also, other families who did not agree with incentives as a solution shared their ideals that people should be able to perform an environmentally responsible action without being given a 'treat.' In addition, even with a 'treat,' it may not elicit the desired result and could create greater demands on what the incentive should be, with the potential to discourage action. A father of three described his perceptions of incentives potentially creating more obstacles remarking:

> …people now expecting a reward to do something that's good for society, I think that has a severe negative consequence. Where now they expect to be rewarded for helping out the environment – and if they don't get that reward, they're going to be in a situation where they might have done something voluntarily before that because they're not receiving an incentive for it, they will no longer do it in the future. I think that has a really, really potentially negative consequence if we start incentivizing people to try to do things.

Another family's mother shared her outlook that people who are likely to do the action will do the action regardless of the incentive stating, "Incentives typically require effort on someone's part and if they're not willing to put forth the effort to do whatever it is you're asking them to do, they're not going to put forth the effort to get the incentive."

Sources of Environmental Awareness: Acquiring and Acting

The below sections describe data that followed Chawla's (1999) coding the most, with some adaptations made accordingly in consideration of exact language used, population researched, and purpose of data collected.

Work-Driven Days of Service. All families had at least one member employed by Lilly, with three of the eight participating families having both parents working there.

Lilly is one of the largest day of service providers in civic engagement for Indianapolis where its headquarters are located. Lilly designates a day every year for city-wide civic initiatives with numerous projects devoted to environmental projects (Lilly, 2017). The family members who worked for Lilly did not always have an environmentally themed service project and did not always choose to participate in any service project. However, all had participated at least once in an environmental stewardship project at some point during their time with Lilly. The outcome about Lilly's day of service was that while the individual may have learned from the intervention, regardless of whether it was environmentally themed or not, sharing at the family level was minimal to nonexistent. Several variables were discussed that could have contributed to this lack of sharing.

When people did not feel like their work was making a difference and they did not find the tangible results satisfying, they did not identify with what was requested of them. This was often found with invasive species removal and it was determined for some that the individuals did not have the background knowledge to understand why invasive species removal needed multiple site visits or why exactly they were ripping out aesthetically appealing vegetation such as honeysuckle. While some groups of volunteers felt there was a lack of information or interpretive education, this was not always the case, as a couple of family participants were able to articulate their knowledge about invasive species after their day of service. Level of engagement may have also played a role (e.g. boots on the ground volunteer versus area coordinator/project lead volunteer). However, there were two members from separate families who were highly involved with the annual day of service city-wide project planning and implementation for multiple years and a lack of sharing about the service activities still existed.

Participants mentioned their frustration with such issues as inefficient planning and procedures, which resulted in poor time allotment for planning a project to be undertaken by a large group of people. They also noted such issues as a lack of appropriate tools for some of the more laborious tasks. Variables that cannot be controlled, like the weather, also contributed to people's positive of negative experiences of their activities.

In addition, performing an environmental stewardship activity out of personal desire versus professional obligation may lead to different perspectives on motivation. As most of the groups are quite sizable, there was and always will be ongoing problems of finding projects that fit within everyone's values and expectations. As one family member who worked for Lilly stated while trying to plan for their department's day of service, "It's tough anytime you have a large group of people to get them all to have a single vision."

However, when projects did align with values, connection to larger impact created feedback in appreciative responses. One individual whose perceptions and language toward Lilly's day of service was typically negative, expressed ownership and positivity when discussing a project where removed invasive honeysuckle was repurposed into a bench for the community. They felt attachment to the act of service when their motivations and actions were aligned through the intervention.

Avenues Through Formal School. Formal school was considered as a source of environmental awareness when salient knowledge and/or outcomes were generated by educational institutions. Formal school initiatives during K-12 and University years were rarely mentioned by the parents as being an environmental knowledge source from their

own school experience, but some recalled their children's school topics that pertained to the environment. For this population, field trips and hands-on programs and projects were mentioned as sources of memorable environmental learning. For example, the youngest participant for the priority lists ranked groundwater pollution as one of their top issues due to their ability to apply their knowledge acquired from their experience with "Project Lead the Way" in Biology.

Two children from another family drew images about what would help the environment based on school activities. The older brother based his answer and drawing on the information he had recently researched during free-time at school, and his little sister drew a picture of people cleaning up the ocean derived from research she had performed by herself for a school project. Neither of them was explicitly taught the information by a teacher. As mother of two young children stated, "Put a program in the school system and make it interactive, because they [students/children] remember things that they actually do so much more than they remember someone standing up there."

For the participants who were still in college or had graduated within the past few years, campus-wide initiatives were mentioned as being more meaningful to them than coursework. Such efforts included construction of new energy efficient buildings and easily identifiable recycling bins with awareness raising aspects, such as displays informing on what can be recycled or facts about the benefits of recycling.

Media. Several mass media outlets were mentioned as sources where the families garnered some of their environmental knowledge and awareness. Only one family mentioned a community newsletter—otherwise, no print media was mentioned. Other sources mentioned included radio broadcasting such as National Public Radio (NPR) and

television shows such as The Daily Show. Two families' parents also brought up the ad campaigns around litter from when they were younger, specifically recalling the public service announcement of the 'Crying Indian' from Keep America Beautiful.

A trend mentioned by at least two of the families pertained to linear television or real-time television broadcast services as no longer the predominant source of media due to advances in streaming technology. Both families explicitly spoke to how this creates need for multiple avenues of communication to broadcast a message. A father of three adult children recalled:

> Like for us, there were three TV channels. They were all kid things from 8 a.m. on Saturday. There was so much educational stuff that they threw at us as kids….they had wrapped the attention of every kid in America. Now there are ways – so many avenues that you have anymore.

Their mother questioned how best to transmit information:

> We were talking earlier about how apps were the best way because TV now is not. You don't have that focus group because there's just so many damn channels on. So what platform is there nowadays? I mean there's so many more forms for connectivity and communications, but no single one, right?

This point was further elucidated through digital media usage.

Digital media avenues were the most prolific in terms of how families could acquire environmental information and connection. Websites, video games, social media, and applications were all mentioned as being modes of access. One family member shared how her dad was using YouTube to post videos of himself tending to his beehives. Another family during one of the interviews took us around their neighborhood playing Pokémon Go!

However, digital media was also viewed negatively as a medium that allowed opinions to be as important as facts, along with narrowing the focus of the coverage and

presenting biased information. A son in his mid-twenties stated his viewpoints on typical media coverage, “Look at the media, it’s more talking about wars than the planet dying. But the planet dying is just as big of a war that we’re fighting right now.” As his dad fervently stated while comparing how content was published online without much policing versus the academia process of publishing:

> The public world, public sphere, doesn’t work like that very much anymore. It’s like, ‘I don’t care if this is peer-reviewed, as long as 150 million people think that this is the way it is – then this is the way it is.’ And it wins the day. And it just seems like a backward step that really undermines all this sort of stuff.

Clubs and Organizations. Boy Scouts of America engagement was mentioned by at least three families, with two of the families’ sons enrolled in Cub Scouts, Boy Scouts, and/or Eagle Scouts at the time of these interviews. The two actively enrolled families spoke about some of the environmental exposure they acquired from Boy Scouts due to helping their sons obtain merit badges, engage in required service projects, and other activities. Nothing specific like Boy Scouts was mentioned for women.

A father whose two oldest sons needed to perform service-learning projects spoke about their experience together to obtain their merit badges. They set-up a visit to Mounds State Park and were trained by a Park Ranger to identify and remove invasive garlic mustard. This experience then led them to teach other members of their family how to identify and remove garlic mustard during an outdoor excursion.

A few the families enrolled their elementary aged children in the Lilly Science Summer Camp on either part-time or full-time basis. A college aged participant still remembered his time at Science Summer Camp as both of his parents worked for Lilly and told us about his experience of planting trees. While he could not remember exactly

where they were, he did remember actively planting a tree. For children, who at the time of these interviews were currently enrolled in the Science Summer Camp, environmentally responsible behavior of picking up litter was a daily exercise, particularly after lunch on the Camp's site. While not explicitly said to have come from the Lilly Science Camp, a noticeable theme in the children's drawings for what helps and what hurts the environment were themes of picking-up litter and litter.

For adult participation in clubs and organizations, several families had knowledge of certain environmental organizations, like Keep Indianapolis Beautiful. However, only one couple spoke to being active volunteers external to Lilly's day of service. They were Adopt-A-Block captains through KIB and had been inspired by a sibling's participation.

People. A prominent theme for how the families' ranked their issue variables was in terms of the threats they posed to human health. In some cases, they considered how dire the threat could be specifically to their children. After assessing their family's issues' rankings, an adult child's partner from a family of five pointed out:

> I think it's interesting how we rated these to where it's 1 is maybe like the most hazardous to … 9 it's like the least hazardous – and do you think that's like a … natural human bias to pick the thing that's the most dangerous to health?

When considering human health threats and the bias towards effects on human life, members from four different families ranked combined sewer overflows as their number one variable due to the bio-waste and "broad reaching public health hazards."

Also, at least three families' mothers explicitly spoke to ranking their issues' variables based on the potential harm to their children's health. A mother and father explained that they had individually ranked the issues according to how they could affect their four children. As one mother remarked with frustration:

> I think for me the sewer overflow – I didn't realize that we do that here…I was running on the White River the other day and saw one of the signs that says like 'your health can be in danger if you get in this water after heavy rains due to the' - I don't know if they actually say raw sewage, but they may say like 'unprocessed sewage.' I was like, that's insane! This is not a third-world country. We should not be putting any untreated sewage into the water systems…and that was just a couple of weeks ago and I was like ugh, that's gross! I mean they [her children] don't know the difference, you know?

Negatively expressed beliefs and behaviors were also formidable to the families' learning and perceptions. One family specifically spoke to opposing viewpoints of civic participants versus government entities, like the Department of Natural Resources (DNR). The parents' pessimistic viewpoints and DNR's lack of appropriate outreach/awareness raising created an impression on their oldest child who participated in the priority lists. This was obvious as they placed environmental stewardship at the lowest rank for solutions reasoning that, "..[the government/DNR] won't let us do anything anyways." Additional references from multiple families' parents included recalling how family members in the past would deal with trash, "my parents threw every single thing out their car window", "You burned it or you went to the side of the creek and dumped it.", and "a lot of my uncles who didn't have recycling capabilities would burn stuff."

While these families did not show excessive signs of exhibiting similar behavior, an example of a family member who did regularly participate in environmentally unsustainable behaviors through their paper product consumption questioned the influence of their own father:

> My dad always had like paper plates and plastic things ready to go cause he was just a single bachelor guy and he was busy all the time. So, he kind of taught me growing up to just use a bunch of shit. Just use paper towels, paper plates, whatever – we'll take out the trash. And, you know, he

> wasn't very well educated. He had a GED, never went to college, so he was kind of less educated. Again, makes me think if he was more educated, if he knew the impact of this stuff, would I be the same person or would I have the same habits?

Families were noticed to form cohesive learning units as well. This outcome occurred when the families had shared encounters. For example, a mother and son who went on a school field trip shared with me together about what they learned about fen ecology through first-hand experience and activities. A mother who grew-up in North Carolina with the beach and ocean as a regular experience and part of daily life realized the distinct difference in her family's ecological cognition when her family visited and saw the ocean and the beach animals, like crabs, for the first time. The recognition of the novelty of the experience for their family augmented the environmental surroundings that had always been normative for her.

When considering how the parents in this study were positively influencing their children's environmental knowledge and actions, a few attributes were noted and categorized. Different modes such as habits and hobbies, like recycling and spending time outdoors, and usage and defining of language, such as when a father told his daughter the difference between bucks and does, were noted. Discipline was an important method for creating and promoting children's respect towards the environment. For example, a teachable moment occurred during an interview with a family in a park when a mother noticed her child plopped their empty orange juice carton onto the ground. She made sure to instruct him to pick it up, and when he did it again later, she maintained her stance. During another family's interview, the youngest found low-hanging tree branches too irresistible not to grab, and his mother got after him scolding, "Be kind to the trees!"

Sibling guidance was another avenue. For example, in one family a specific environmental theme of chemical spills came out of the oldest child, and then their siblings responded with similarly themed drawings. Another adult family member brought up her sister who introduced them to KIB's Adopt-A-Block program, which seemed to enforce their environmental activities as they became Block Captains for their neighborhood through this intervention. Extended family such as grandparents and cousins, not observed in this research, were mentioned by the families as being sources of environmental exposure as well.

Place. Experience of natural areas was prevalent through many different avenues, such as play, camping, fishing, and exercise. Some of our interviews occurred at local parks, like Carmel West Park in the outer suburbs of Indianapolis' metropolitan area and White River State Park in downtown Indianapolis. Other experienced modes of natural areas for the families included travel to natural area destinations, as well as methods of travel such as cruises. One family's parents spoke extensively about the differences they noticed in their four children when they were able to take them on vacations to natural spaces such as Deep Creek Lake in Maryland, and how their children switched to engaging with nature, rather than focusing on their electronics. The father of this family also found that these visits to natural areas relaxed and recharged him. Another family's mother of two discussed that she thought:

> …half the battle of getting people to think about the environment is just…-like with these guys [her children], you know, we do a lot of outdoor activities. They are outside a lot, they play outside a lot. We just do a lot outside – I think that people who don't do that and their kids who don't do that, don't ever have that frame of reference so they don't – it's not something they ever think about.

Regional geographical characteristics determined whether physical resources of an area were viewed and treated differently. A parent from California spoke about learning from an early age how to conserve water, but since moving to Indiana she noticed:

> I guess we have plenty of water because I don't hear people talking really about it. Even things like when I see people doing their dishes, they have the water on, you know, when they're just wiping down their counter and stuff. I'm kind of thinking 'Turn that water off!'

Another family member raised in Indiana confirmed this regional environmental difference when speaking about urban water engineering, "I saw that as a less of a central Indiana issue, and more of a West Coast, you know, where water's in short supply. We're always getting replenished water, all the time."

The families also related their knowledge around different solution and issue variables from the prioritization lists to places based on city-wide and home levels. One family member thought about urban heat island by situating the definition of impermeable surfaces in the context of the Cultural Trail in Indianapolis, a downtown trail that used pavers instead of pavement. Another family who conversed about solutions to urban heat island effects noted how the revitalization southeast of Indianapolis' downtown was occurring by reusing an already developed area versus increasing urbanized spaces. Combined sewer overflows were ranked highly when individuals were aware of their presence in Indianapolis' waterways.

Parents also related their knowledge to issues through recalled past, salient place experiences based on where they had lived previously. A father of three ranked brownfields high based on his knowledge around Indianapolis' sites and growing-up in Pittsburgh, Pennsylvania. Individuals also identified through a place's resource. For

example, a mother of two discussed how she grew-up in the country and how this interplayed with her issues' rankings, as well as an Other issue she listed of light pollution. She expressed through her place identity to growing up in the country how important it was to her for her children and grandchildren to be able to have similar environmental experience:

> When I was a kid you could go outside and see all the stars and the – even the time like in the 15 – 20 years since I was little, it's significantly changed. And that is crazy to me. And I don't want my grandkids to not be able to see the stars. That would be horrible.

Another mode of heightened environmental awareness was revealed through if concepts existed in proximity to the families' current homes. For example, brownfields were ranked high by a couple who lived near two well-known ones in their community, an old Firestone Plant and Mill. This same couple had placed chemical pollution and groundwater pollution as their top two issue variables with their reasoning based off their home residence being near Morse reservoir and surrounding industrialized farming practices, and ultimately how this could affect their children's health. They would not allow their children to swim in the reservoir due to the water pollution hazards (fertilizers, pesticides, fecal matter, etc.) from adjacent farmland.

Another family whose backyard bordered Geist reservoir applied their knowledge of invasive species, citing examples of how these species were problematic for their neighborhood both terrestrially and aquatically. They spoke about emerald ash borers and that "several houses have had most of their trees cut down." Their daughter described her invasive species ranking through her knowledge of zebra mussel migration to Geist. The mother spoke about new community policies where homeowners on the reservoir would be charged to help eradicate invading Eurasian milfoil.

The issues were ranked lower when not perceived as a problem within immediate surroundings. As a father of three reflected, “For me, these [issue variables], I said a lot of them can be global, but to me it’s really only important to me if it’s around me.” However, when the issues were considered within immediate surroundings, he replied “I would be changing my behavior and being very much more aware…” Another parent pointed out, “I think the other thing that is important is using relevant local examples…You have to make people care about the impact to get them to do something about it.”

Like environmental awareness, heightened environmental activity occurred when considering locational proximity of issues and access to solutions. One family anchored their environmental actions around their home due to their neighborhood being located off Morse reservoir. Their informed actions were a result from the community’s communications (newsletters, emails, etc.) educating people to pick-up grass clippings, not use fertilizers, where their storm drains empty (into the nearby reservoir), lake levels, etc. As the family’s mom admits for her listing of Other solutions for ‘improving accessibility to encourage investment in maintaining safe, healthy waterways, “When we didn’t live near the lake, it wasn’t even on our radar. Living here now, now you care because you’re like [Dad: Clean water.] well aside from all that too, it kills your property values.” Within the home, around half of the families were observed recycling. Nine drawings from the younger children about their favorite thing to do outside were also noted to be activities that they could participate in around their home and neighborhoods.

A couple of families discussed maintaining care of place around their neighborhoods’ streets by picking-up litter. For one family, the father mentioned he and

his neighbors kept their street clean. The other family participated in an Adopt-A-Block program and hoped to engage their neighbors through Housing Association meetings. As they viewed this initiative as an accessible environmental action route, one family member aspired:

> Maybe start it as more of a grassroots thing just focusing, instead of being so overwhelmed by like global warming and the world, focus on beautifying your neighborhood, your subdivision, your community, and then maybe that would arc something in people to go out from there to their city, their state, whatever.

A few families perceived environmental degradation, such as littering, as place detachment. Pride was explicitly stated as a mechanism as to how well a place was taken care of or not. One mother queried her three daughters and husband as to why litter still existed and theorized herself that litter systemically resulted from "probably more important issue is that people aren't connected or don't feel an ownership or sense of responsibility towards areas."

Discussion

Limitations

Limitations existed in how we implemented versus how we initially proposed our approach. Initially, the research plan had been to understand the impact of Lilly's day of service intervention on individuals and their families in terms of their attitude toward the environment. Two of the starting interviews were placed pre- and post- to the Lilly day of service. While results did allude to the individual learning from the intervention, sharing at the family level was minimal to nonexistent. While this outcome was interesting, it created very little to be further explored in terms of the day of service intervention in a family setting. An article describing informal environmental education in Poland

concludes non-formal education among adults is not a notable method for environmental awareness (Wojcik, 2004).

Another limitation was our ability to meet with all the families for the prioritization lists. All families were interviewed for the issues list, but one family's answers are missing for the solutions list due to scheduling conflicts. Also, one family's late adolescence daughter was present for the issues list, but not the solutions list while a different family's mid-twenties aged daughter was present for the solutions list, but not the issues list. However, most responses were from the same people for both lists.

The longitudinal nature and qualitative aspect of the data also posed limiting factors. Transcriptions of all 52 interview were not possible due to lack of provided personnel resources and funding. According to Bernard (2006), for each recorded hour, it can take up to six to eight hours to transcribe. Through personal experience, this was an underestimate with these interviews due to the group dynamic. "And when you get through transcribing, there's still coding to do (more hours) and analysis and write up (lots more hours)" (Bernard, 2006, p. 189). These factors made it necessary to only focus upon the interviews that were the most tangible with the most conclusive ones being the interviews with the prioritization lists.

Overall, this research and the mode of data acquisition and analysis reveals how less environmentally active citizens garner knowledge and act regarding their environmental awareness. The families had to rank their lists based on what they knew and had experienced. These conversations help us to understand how the individual and families ascribed and situated their environmental awareness, knowledge, and actions – including where they placed their priorities.

Review of Environmental Hindrances

Language blockages through jargon posed problems. I noticed when there was a lack of understanding or experience with the variable, it was typically rated lower. This outcome represents the obstacles we face in finding common language to increase environmental education and action accessibility.

Another hindrance concerned corporate responsibility and lack thereof. The feeling of helplessness behind what a person can proactively accomplish on their own compared to the level of destruction corporations are executing shows the disparity in the scale of how we approach mitigating and reinvigorating our environment versus the allowable limits corporations legally consume and disparage our finite resources for their bottom line. Having pointed a finger at corporations, a theme around lifestyle and convenience also received attention as individual's contribute to a culture of waste and negligence of resources. Once the ability of convenience is compromised, enough of a barrier exists for participation to stop. Durable goods have been exchanged for disposable items, increasing the throw-away aspect of American society.

Knowing who to trust as environmental authorities was another hindrance. Utilizing critical media literacy skills, the families rightfully questioned and challenged the scientific reliability and validity of mass media sources. Similarly, when actual experiences and outcomes did not align with expected environmental outcomes from authorities, it made the audience even harder to reach due to lack of trust and skepticism which developed from feeling misinformed. However, implicit trust in environmental authorities and/or regulations also raised an issue. The trust seemed to allow a level of

comfort in not knowing, as well as not seeking more information about the environmental issues that could be detrimental.

Lastly, cost inhibition was a thematically noticed topic with most of the families for what hindered their pro-environmental behaviors. People had to be willing to recognizing the money spent contributed to the bigger picture, such as the potential shift these types of products could cause based on the supply-demand aspect of consumerism. This begs the question of if costs, particularly lower level prices for being able to conveniently recycle at home, for individuals with socioeconomic autonomy are prohibitive, how would people at poverty level ever be able to choose or feel the responsibility to choose more sustainable alternatives and options?

Review of Solution Variables

Education was prioritized as the number one solution when considered as an aggregate outcome for all families. Yet, there were limitations referenced and observed for certain modes of education to be salient avenues. For the formal school education code applied to these interviews, experiential learning was the main mode recalled by both parents and children as more significant than what students may have learned passively, similar to Chawla's (1999) education code and outcomes. Experiential application was also referenced within informal methods of learning, such as engaging in an environmental stewardship activity itself. In addition, visual modes of communicating environmental initiatives and awareness were described as helping with tangible understanding.

Environmental stewardship was within the top three priorities for overall outcomes. However, external to provided work service days or Boy Scouts, which have

specific limitations on who can participate, most families did not consistently behave outside of these. Thus, the environmental stewardship variable, although highly ranked, did not have notable, continuous, accessible, volunteer-type behaviors for report for most of the families. The few families who did show and discuss consistent activity predominantly directed their energies towards neighborhood environmental stewardship, playing into sense of place theory which will be described further in the following section.

For viable solutions, incentives and legislation showed a divide among families and family members and were both considered overall as mid-level priority, with compelling arguments for why or why not these solutions would work. The families consider legislation to be one of the few ways that corporate pollution could be better controlled, while lack of effective implementation of existing policies and desire for less government control were deciding factors for why legislation would not be a good solution. In regards to negative feedback on the solution of incentives, family members perceived incentives as creating a desire or want for reward instead of encouraging people to voluntarily act, and most people who would receive the incentive were going to do the action anyway. Other family members viewed incentives as worthwhile and a way to be considerate of people's time and efforts. However, as can be noted through the families' differing ideals on compensation, not everyone is incentivized in the same way, which can create issues for best practices towards motivating and maintaining pro-environmental actions.

Review of Sources of Environmental Awareness and Action

Multiple modes for environmental knowledge processes and stewardship had similar outcomes to sources of commitment for environmentalists (Chawla, 1998, 1999), and included equivalent codes applied to the less environmentally committed population for their sources of exposure. Work-driven days of service was one method of environmental exposure, particularly since at least one family if not more worked for Lilly and had participated at least once in some form of environmental remediation project such as invasive species removal. However, this was not a consistent method of exposure to environmental stewardship as the projects that people were involved in differed from year to year.

Formal school was also mentioned, and as described above more experiential learning was the most viable method for people to recall. On the other hand, themes that were more highlighted in this research than historically noted were online and digital learning. These virtual modes have become prevalent both formally and informally, and this is significant within the research outcomes. No one in this population referenced any printed media, such as a book or author as a source for their environmental awareness, unlike earlier referenced studies on environmentalists' sources of commitment from the 1980s and 1990s (Chawla, 1999; Palmer, 1993; Tanner, 1980). Digital media provides multi-modal abundance in information and activities, but at times comes with a cost in quality of information presented.

Clubs and organizations supply informal, experiential learning for children that can create memories and knowledge that carry over into adulthood. This research provided examples that showed how these experiences can empower children to also

teach others, in this case, how to be an environmental steward. However, we learned from one participant this does not necessarily equate to stewardship being performed up to or during adulthood. Boy Scouts for two of the families was a prominent method for environmental stewardship for their children yet required heavy parental engagement and exclusivity of sexes at the time. Since February 2019, Boy Scouts has changed their policies; since they now allow girls to join, their new name is Scouts BSA (Boy Scouts of America, 2019). While in our sample this population did not show a substantial adult engagement in environmental organizations other research shows that organizations were one of the more predominant sources of environmental commitment in adulthood, with at least 25% of their environmentalist sample mentioning them (Chawla, 1999).

When analyzing rankings and reasoning of the prioritization variables, thematic ideas that encompassed more societal and holistic thought-processes emerged when considering coding for "people." For example, if an issue's variable was perceived as a necessity to better serve society's needs, then it was defended more. Human health aspects were drivers for how people ranked their issue list, especially if the issues might affect their own children's health. This research also highlighted the importance of parental and sibling guidance and direction when considering pro-environmental habits and respect.

Experience of place for these families encompassed many areas. Two families' parents emphasized how their children interacted more holistically in the natural environment and they emphasized that being outside was enriching for both their children and their own sources of insights. Families spoke about experiences of different natural

places and how places, such as a past and or current home, anchored them in their environmental perceptions and actions.

Conversations and activities revealed that knowledge and awareness around environmental issues and thoughts towards solutions revolved around the locational aspect of place. Regional differences, such as water availability, were discussed through the lens of environmental issues and how perceptions and actions can vary based on propinquity of issues. When issues were in closer proximity, specifically to the families' homes, deeper environmental awareness and knowledge was noted. For the parents, this was observed through past home locations and nearby resources and issues that were tied to these memories of where they grew-up. For current home locations, parents and children were both observed to embed their environmental knowledge within their home locale to describe their surrounding awareness and actions, with some utilizing this to emphasize their priorities reasoning and drawings.

Place-based action orientated towards the home and its locale underlined an idea one family member shared who was active around their own home and neighborhood in that it helps to reduce the feelings of immense helplessness and could potentially increase undertaking larger initiatives, as well as heightening awareness towards how these "smaller" actions can contribute to decreasing the enormity of the collective and systemic environmental issues. One family spoke specifically to how lack of environmental care hinged upon connection and ownership to place being absent.

Conclusion

As demonstrated through this research, salient environmental exposure and experiences occur through multiple sources for environmentally non-active citizens that

were similar to antecedents for environmentalists' sources of commitment. This general outcome aligns with research where an environmentalist inquired about her own influences given that her siblings who were raised with the same parents and surroundings did not result with the same environmental commitment (Cromwell, 1988). Yet, environmentalists' experiences showed that a potential avenue that creates a more environmentally aware and motivated individual could result from depth of essential experiences during childhood (Chawla, 1999). While childhood memories were reported in this research, it was not an overly predominant theme mentioned when discussing environmental awareness and action. However, while children's environmental education exposure is of utmost importance, given the time estimates of further climate change impacts if necessary changes are not made now (IPCC, 2018), we cannot wait for our children or future generations at this point to come of age to completely change negative environmental outcomes.

An important and consistent aspect that came out of this research was that knowledge about and/or action towards environmental issues was determined by the variable of proximity and situated in place for considerably non-active citizens. As such, sense of place needs to be strengthened as a statistical analysis on place attachment showed "We are most willing to defend places that are strongly tied to our identity and for which we hold negative attitudes ("important but threatened")" (Stedman, 2002, p. 576). Also, pro-environmental behaviors have been attributed to people's heightened sense of place through aspects of place attachment and/or place meaning, and providing messages and mechanisms to promote sense of place attributes may help to increase pro-environmental behaviors (A Kudryavtsev et al., 2012; Scannell & Gifford, 2010b, 2013;

Vaske & Kobrin, 2001). To better address what mechanisms might work to assess connection to place, also known as sense of place, the following chapters cover two different style interventions and their effectiveness.

Chapter Three

Project Two – Hidden Assets: Addressing Indianapolis' Poorly Perceived Waterway Landscape

Introduction

Framing Indianapolis' Waterway Challenges

For centuries, waterway engineering has allowed society to control the movement and location of water to better fit society's needs. The historical shaping of Indianapolis' water sources has, in many respects, created the current city. Early planning efforts of Indianapolis' greenway systems focused on the rich landscape of rivers and streams the city possessed. Formed in 1885, the Board of Park Commissioners hired John C. Olmsted, a landscape architect, who developed a plan of parkways along the waterways of Pogue's Run and the White River. Another landscape architect, George E. Kessler, was brought in from 1908 to 1915 to continue Olmsted's plans. Kessler integrated Fall Creek and Pleasant Run parkways into the city's plans (Indy Parks & DPW Indianapolis, 2014). In 1928, Lawrence V. Sheridan, also a landscape architect, incorporated Little Eagle Creek, Little Buck Creek, and Lick Creek into the 'Kessler Plan' (Indy Parks & DPW Indianapolis, 2014). The framework for development of Indianapolis' waterway landscape was set, "To this day, Kessler's parks and parkways are the backbone of the Indianapolis Park System (Indy Parks & DPW Indianapolis, 2014, p. 26)." However, around the same time as the greenway plan development, Indianapolis waterways were also undergoing infrastructure changes that would produce problematic legacies.

At the turn of the 20th century, Pogue's Run was viewed as an obstacle by city planners due to flooding downtown and raw sewage smell. The city planners designed a

way for a portion of Pogue's Run to flow through storm sewers under the city until meeting the White River (Delaney, 2016). To date, Pogue's Run's massive outflow can be seen where Kentucky Avenue runs under Interstate 70's overpass from the White River Trail. Also, sewer systems to direct stormwater were being built in Indianapolis around the same time as the city landscape development. Over time, sewage lines from homes and businesses were attached to the stormwater pipes, which created 'combined sewers.' This technology was considered state of the art at the time but is now currently a major issue for the health of Indianapolis' waterways.

When it rains, even a minimal amount in Indianapolis, both the stormwater and raw sewage are directed into the waterways. The waterways have such high pollution from combined sewer overflows (CSOs) that the U.S. Environmental Protection Agency (EPA) has mandated via the Clean Water Act that Indianapolis must decrease these overflows. Citizens Energy Group has implemented a Long-Term Control Plan (costing ~$1.6 billion) that will be completed by 2025. Citizens Energy Group is fulfilling the role of environmental remediation through a large-scale tunnel system known as the DigIndy project to alleviate the Indianapolis waterways of the sewage pollutants during high water volume events such as storms and snow melt. The tunnel systems will not be fully completed for all pertinent waterways until around 2025 (Citizens Energy Group, n.d.). Sewage is not the only issue; storm sewers can also convey litter that people discard on land. While rubbish can enter waterways through a multitude of avenues, wet weather events can transport trash on land directly via runoff into the waterways or into the storm drains that empty into the waterways (Boyd, 2018; National Oceanic and Atmospheric Administration, n.d.).

The importance of waterway pollution via local sources expands into a much larger geographical issue as the vast majority of Indiana is part of the Ohio River Sub-Basin, which is a sub-basin to the Mississippi/Atchafalaya River Basin (MARB) (Environmental Protection Agency, 2016c). The mouth of the Mississippi River feeds the Gulf of Mexico, one of the world's biggest dead zones due to agriculture and urbanization practices. This area of hypoxic water is caused by nutrient enrichment mainly from nitrogen and phosphorus which can both be found in sewage (Bruckner, 2012). The Gulf of Mexico also has some of the highest concentrations of plastic due to the trash stream of the Mississippi River. Plastics, like water bottles, were quoted as the number one type of garbage floating down the Mississippi River (Boyd, 2018). Thus, the way Indianapolis waterways are proximally treated is consequential to environmental health downstream.

While waterways should be perceived as natural assets, their human and environmental health liability create a justifiably negative association, rendering community and individual associations with and investments in local waterways challenging. Out of civic interest, initiatives have developed to positively and informatively reconnect and create attachment for individuals and communities to the landscape of waterways in Indianapolis and elsewhere. A grass roots collective impact that works on the community level in promoting environmental knowledge, awareness, and stewardship is Reconnecting to Our Waterways (ROW). ROW was established in early 2012 as a collective impact initiative to target cultural, economic and educational growth opportunities along waterways (Reconnecting to Our Waterways, 2015). In pursuing their endeavors, ROW partners with other like-minded initiatives such as The

daVinci Pursuit, a nonprofit "founded in order to bring science education and cultural enrichment closer to the public" (The daVinci Pursuit, n.d.). Both organizations utilize art as a mechanism to raise environmental awareness.

Applying Environmental Artwork to Theory

ROW and The daVinci Pursuit have individually and collaboratively funded environmentally themed art and accompanying signage throughout Indianapolis communities. This research assessed an art piece by Phillip Campbell titled A Thousand Bottles. Campbell used over a thousand water bottles to create a replicate of one large water bottle (~six ft. tall). The message is a visual communication of the amount of water bottle/plastic we as a society consume and the compounding impact an individual's actions can have when littering or cleaning-up (Kesling, 2015). The mobile signage placed beside the artwork spoke to the way water bottle litter can negatively affect the local waterways all the way to the Gulf of Mexico. The signage articulates the concepts and provides description and imagery of the specific waterway (ex. Pogue's, Central Canal) ultimately contributing to the Mississippi River which then empties into the Gulf of Mexico.

The overarching theme of the artwork and signage were to inspire people's environmental behaviors through awareness about and connection to their local waterway resources encouraging sense of place. The implemented survey assessed place attachment to review an aspect of sense of place. As defined in the larger introduction in Chapter One, sense of place and place attachment definitions are messy (Trentelman, 2009) and discipline dependent (Žlender & Gemin, 2020). For this research, I considered the survey construct items' language to reflect place attachment, a necessary component of sense of

place. Place attachment refers to "the relationship between a person and the land or community, or a specific physical setting within which one lives" (Alam, 2011, p. 637). The waterways are a specific physical setting for Indianapolis residents and neighborhoods. Thus, the environmental artwork was exhibited near the local waterway of the community, so the art and waterway landscape components were viewed and considered together.

Place Attachment's Relationship With Environmental Behavior and Intentions

When considering environment issues in a community context, Vorkinn and Riese (2001) found that a Norwegian rural community's attitude variance towards a major hydropower development was explained more by place attachment than sociodemographic variables. While sense of place relationships are often associated with long-term periods in a context that is environmental specific, they can still occur in a shorter time via "an intense experience or through a strong functional dependence on a certain type of place" (Ardoin, 2006, p. 119). For example, in research conducted concerning Kimberley's Fitzroy River and potential damming of the waterway, ethnographic data described how shared perspectives of non-indigenous people revealed a deep sense of attachment when the place was threatened (Toussaint, 2008). "If these attachments to local resources have consequence in other aspects of a person's life, individuals may be more likely to behave in an environmentally responsible manner in general" (Vaske & Kobrin, 2001, p. 17). Halpenny's (2010) study on visitors surveyed at Point Pelee National Park found place attachment could be an important factor for encouraging individuals' environmentally responsible behaviors.

As such, place attachment is an important to understand in relation to environmental behavior and both variables can be analyzed via survey methodology (Halpenny, 2010; Jorgensen & Stedman, 2006; A Kudryavtsev et al., 2012; Vaske & Kobrin, 2001; Vorkinn & Riese, 2001; Walker & Chapman, 2003). Halpenny (2010) employed a number of methodological frameworks with Fishbein and Ajzen's (1975) Theory of Reasoned Action to investigate place attachment and pro-environmental behavioral intentions relationship. Theory of Reasoned Action postulates that intention to perform a behavior is the best predictor of behavior, thus, the intention to execute the behavior resulted in part by the person's attitude towards doing the behavior (Fishbein & Ajzen, 1975; Halpenny, 2010). To assess outcomes for this study, general baseline environmental behaviors and intended general environmental actions were measured.

The art and ensuing survey analyses helped inform stakeholders, such as ROW and the daVinci Pursuit, about methods and modes of delivery (e.g., art) that may work to raise environmental awareness and action. Specifically, this research reviewed the temporary and moveable A Thousand Bottles installation's exhibit at two Indianapolis community events. The mobile piece was displayed during two community festivals where survey data was collected from attendees who engaged with the exhibit. This research evaluates how utilizing artwork to create awareness can provide an experience for people to recognize their role in environmental issues and solutions, particularly when situated within proximity and as part of the overall landscape of a basic resource that needs protected. The research questions addressed are:

- Does the artwork function as a mechanism for place attachment?

- What is the greatest predictor for the art's ability to positively affect people's intentional environmental behaviors?

Methods

Sites and Data Collection

The temporary environmental art installation, A Thousand Bottles, and accompanying signage were displayed in the fall of 2016 during two Indianapolis community events, the Feast of Lanterns and Open Bite. At both one-day events, the art was exhibited during daylight hours in the afternoon into the evening within the waterway landscape. The Feast of Lanterns event was located within an Indianapolis community park where the Pogue's Run waterway flows through. The art installation and educational signage were placed near a functioning historical pedestrian bridge that served as an entry into the park and event, as well as crossed over Pogue's Run (Figure 3.1). For the Open Bite community event, the installation and signage were set-up on a bridge that crossed over the Canal waterway and was also an entry into the festival. The two community events also had similar design to celebrate local musicians, artisans, and organizations by providing a space to display their talents, wares, and promotional resources. The events were sizable enough for the communities that roads had been blockaded in and around the festivities.

Figure 3.1

A Thousand Bottles Exhibit at Pogue's Run Feast of Lanterns Event

Data collection occurred by convenience sampling via intercept surveying. Two surveyors stood nearby and requested event attendees who stopped and interacted with the exhibit to take a survey. Not everyone who stopped could be surveyed due to limited resources (clipboards, personnel, etc.) but the majority of those approached were willing to participate with an aggregate sample from the two events equaling 65 (44 people at Pogue's Run event and 21 people at Canal event). All participants were above the age of 18. Participants had an opportunity to voluntarily enter a lottery for a $25 gift card.

Survey Instrument

To assess the communities' reactions to the environmental art installation, survey data was collected at the two community events where the art was exhibited as previously described. The survey was administered in-person and consisted of one-page with items and questions on the front and back. The survey length and measures were kept short in order to retain greater buy-in from approached participants and minimize boredom or

fatigue response biases (Anastasi, 1976; Hinkin, 1995; Schmitt & Stuits, 1985; Schriesheim & Eisenbach, 1990).

The survey instrument (see Appendix B) predominantly consisted of items measured on a five-point Likert scale. The Likert scale was used to better assess those who have moderate feelings versus those with strong feelings (Spector, 1992). The Likert-scale design also allowed for item-reduction analyses where certain items combined evaluate an underlying construct (Adams & Lawrence, 2015; Spector, 1992). The constructs covered baseline environmental behaviors, as well as participants' perceptions of the art installation's characteristics for educational growth, place attachment to the waterway, and intended environmental behaviors. Some survey items were borrowed or adapted from other survey instruments noted via endnotes in Appendix B on the attached survey instrument (Coombes et al., 2010; Kaiser et al., 1999; Maloney et al., 1975; Zhai & Scheer, 2004). The survey also covered other types of data such a qualitative feedback on current and desired environmental behaviors, as well as demographic information.

Quantitative Analysis

Descriptive statistical analysis informed on several of the survey's questions, such as site and art piece engagement levels. Principal component analysis (PCA) calculated whether thirteen Likert-scale items designed to assess four constructs could be reduced. These constructs included baseline environmental behavior and aspects of the installation's influence on participants' educational growth, place attachment to the waterway, and intended environmental behaviors. The PCA method followed the Laerd Statistics PCA tutorial and guide (Laerd Statistics, 2015b). Internal consistency of each

construct was also calculated. Internal consistency is a way to assess if items are measuring the same construct and their reliability of scale (Adams & Lawrence, 2015). The internal consistency test calculated for each dimension was Cronbach's α. The constructs were accepted based on the rule that a scale that reflects internal consistency should produce an α of 0.70 or higher (Adams & Lawrence, 2015; DeVellis, 2016; Kline, 2005).

A multiple regression was calculated utilizing Laerd Statistics multiple regression tutorial and guide (2015a) to understand whether the art installation's influence on general environmental behavior could be predicted based on participants baseline environmental behaviors and the installation's approach to the educational topic and place attachment. The regression's importance particularly for this research is to analyze the relative contribution of each predictor variable. All analyses were conducted via software SPSS Statistics V. 25 (SPSS Inc., 2017).

Qualitative Analysis

Two open-ended questions were posed to collect data about people's current environmental behaviors and desired behaviors. The open-ended aspect allowed for various answers to be reported. In order to cohesively analyze the range of data items, thematic coding was utilized to organize and identify the salient patterns throughout people's responses (Braun & Clark, 2006). Responses were interpreted and represented via a pro-environmental action lens to describe both data sets.

Results

Population Characteristics

Surveyors approached individuals who interacted with the art and signage for feedback during daylight hours at two weekend evening community events. Most people approached at both events agreed to be surveyed with a total of 65 participants. Appendix B: Tables B1 and B2 provide a synopsis of the sample population's demographics for those who responded to this portion of the survey. All characteristic data outcomes encompass aggregate results and are also presented by community. The question of 'How do you describe yourself?' was a multi-response question, with most people self-identifying as white (see Appendix B: Table B1). The gender ratio for the total population was nearly 1:1. Most participants identified between the ages of 25 to 44 at 62.7%. Income showed a multi-modal outcome with $30,000 - $39,999 and $50,000 - $59,999 selected the most. The overall population was also highly educated as most participants (67%) responded they had college or post-college degrees (see Appendix B: Table B2).

Participants' Site and Art Engagement

While 32% of survey respondents had never been by the respective community areas, 29% were frequent visitors as they came by the area at least once a month if not more often. The remaining 39% of respondents had been to the areas but visits were infrequent (see Appendix B: Table B3). The top reason people stopped and engaged with the art was due to curiosity (see Appendix B: Table B4 and B5). Most respondents reported looking at the art and reading the signage as their mode of engagement, yet some did physically engage through touching the piece (see Appendix B: Table B6).

Likert-Scale Items

The Likert-scale items were designed to gauge participants' baseline environmental behaviors as well as gather perceptions about the art installation. Thirteen items were reducible as described below with non-reduced Likert-scale items analyzed for supportive data descriptions to provide more depth to the aspects under review.

Variable Reduction. The thirteen items pertaining to the four constructs of baseline environmental behavior and aspects of the installation's influence on participants' educational growth, place attachment to the waterway, and intended environmental behaviors were analyzed through a principal component analysis (PCA). The suitability of PCA was assessed prior to analysis. While the overall sample size fit the suggested minimum of five cases per variable (Laerd Statistics, 2015b) at 65 cases per 13 variables, some of the items had missing data with the lowest at 62 responses. Due to being so close to the required minimum, all other assumptions were closely examined to ensure quality of analysis. Inspection of the correlation matrix showed that all variables had at least one correlation coefficient greater than 0.3. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.73 with classification of middling, with individual KMO measures all greater than the minimum of 0.5 as according to Kaiser (1974). Bartlett's test of sphericity was statistically significant ($p < 0.0005$), indicating the likelihood the data was factorizable.

PCA revealed four components that had eigenvalues greater than one and which explained 35.2%, 17.3%, 10.5%, and 8.9% of the total variance, respectively. The scree plot (see Appendix B: Figure B1) indicated that four components should be retained via visual inspection (Cattell, 1966). In addition, a four-component solution met the

interpretability criterion, thus, four components were retained. The four-component solution explained 72.0% of the total variance. A Varimax orthogonal rotation aided interpretability. The interpretation of data was consistent with the constructs the survey was designed to measure with strong loadings of influence on environmental behavior on Component 1, baseline environmental behaviors on Component 2, place attachment on Component 3, and educational growth on Component 4 (see Appendix B: Table B7).

The four underlying constructs' internal consistencies were also measured by calculating Cronbach's α. The baseline environmental behaviors construct consisted of three items and had a high level of internal consistency, as determined by a Cronbach's α of 0.812. Educational growth consisted of three items and had an acceptable Cronbach's α of 0.742. Place attachment to the waterway consisted of three items and produced an acceptable Cronbach's α of 0.765. Influence on environmental behavior consisted of four items and had a highly acceptable Cronbach's α of 0.871 (see Appendix B: Table B8).

Participants' Baseline Environmental Perceptions and Behaviors. Most participants either strongly or somewhat disagreed (82% cumulative) that an individual's actions are too small to have a significant effect on the environment (Zhai & Scheer, 2004) (see Appendix B: Table B9). People also identified as predominantly feeling sad (73%) when they thought about all the environmental issues we face (Maloney et al., 1975) (see Appendix B: Table B10). Three items addressed participants' own baseline environmental behaviors, which were reducible into one variable. The combinable statements included: 'I always consider the environmental effects of my actions.', 'I feel responsible about current environmental problems.' (Kaiser et al., 1999), and 'I am willing to take action that might be out my way to better the environment.' (Maloney et

al., 1975) (Cronbach's $\alpha = 0.812$). The mean of the participants' baseline environmental behavior construct was 4.01 corresponding to 'Somewhat Agree' (see Appendix B: Table B11).

A qualitative question requesting people to self-report something they already do to help the environment was also on the survey to better understand people's respective baseline environmental behaviors. The thematic coding analysis revealed that reduce, reuse, and recycle behaviors were the top pro-environmental actions listed for both populations, with the data item recycling being listed a total of 33 times out of 42 responses and 54 respondents. Cleaning up the environment was mentioned 2nd most often, such as picking-up trash, with transportation behavior and preserving energy actions tying for third. Responses were similarly distributed between the two communities as well (see Appendix B: Table B12).

Educational Purpose and Topic. The next portion of the survey assessed the art installation's environmental education aspect. The first three Likert-scale items addressed if attendees considered the art piece as educational and their familiarity with the overarching topic. Most respondents affirmatively responded that they were aware that the piece was trying to educate them (92%), and they recognized that the piece had a deeper meaning (94%). The average response for people's familiarity with the displayed educational topic was closer to neutral (mean = 3.4) with nearly half (46%) of respondents identifying as neutral or disagreeing that they were already familiar with the displayed educational topic (see Appendix B: Table B13).

The next three items assessed if the installation promoted learning via the exhibit. The three statements identifying educational growth were: 'This piece expands my

knowledge on the educational topic.', 'This piece makes me think differently about the educational topic.', and 'This piece makes me want to learn more about the educational topic.' and were combined into one variable (Cronbach's $\alpha = 0.742$). The educational growth construct had a mean of 3.71 (see Appendix B: Table B11). Rounding this average outcome corresponds to people generally somewhat agreeing.

Place Attachment to the Waterway. The next portion of Likert questions covered participants' feedback on place attachment to the waterway through interacting with the art piece. The three statements 'This piece draws my attention to the waterway.', 'This piece makes me feel attached to the waterway.', and 'This piece gives me a way to connect to the waterway.' were found to be combinable into a place attachment dimension (Cronbach's $\alpha = 0.765$). The aggregate's mean was 3.92 relating to 'Somewhat Agree' (see Appendix B: Table B11). Respondents most often identified as neutral (43%) about the art installation changing their perception of the waterway (see Appendix B: Table B14).

Intended Environmental Behavior. The last Likert portion of the survey covered the potential influence of the installation on general environmental behaviors. Four items, 'This piece inspires me to be more aware of the environment.', 'The piece makes me feel responsible about the environment.', 'This pieces makes me think about how I can help improve the environment.', and 'This piece makes me want to change my behaviors.', were combinable into one construct (Cronbach's $\alpha = 0.871$). The aggregate's mean was 4.02 relating to 'Somewhat Agree' (see Appendix B: Table B11).

To further assess what future intentional behaviors could specifically include, respondents were asked to list what they would like to do to help the environment. The

top three topics reported aligned with the baseline environmental behavior dataset's themes top three. The Pogue's Run community showed a particular prevalence to describe intensifying their behaviors in reducing, reusing, and recycling, as well as change their transportation behaviors. The third option was also a theme of preserving energy but differed from the baseline question's responses by revealing actions that could also create energy, such as solar panel install. While the Canal community had these three topics come up, their answers did not show a noticeable preference towards any of the identified themes (see Appendix B: Table B15).

Multiple Regression

A multiple regression was conducted to understand whether the art installation's influence on general environmental behavior could be predicted based on participants baseline environmental behaviors and the installation's approach to the educational topic and place attachment. There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were two cases with studentized deleted residuals greater than ± 3 standard deviations with values of -3.06 and -4.06, but no leverage values greater than low risk (Huber & Ronchetti, 2009) and no influential values for Cook's distance above 1 (Cook & Weisberg, 1982) . The assumption of normality was met, as assessed by a Q-Q Plot.

The multiple regression model statistically significantly predicted the influence on environmental behavior, $F(3, 55) = 12.494$, $p < 0.001$. The R^2 for the overall model was

40.5% with an adjusted R^2 of 37.3%, a small to moderate effect size (Cohen, 1988). Educational growth and place attachment constructs were statistically significant to the prediction, $p < 0.01$. Regression coefficients and standard errors can be found in Table 3.1.

Table 3.1

Summary of Multiple Regression Analysis

Variable	***B***	**SE_B**	*б*	***p***
Intercept/Constant	2.464	2.454		0.320
Baseline Environmental Behaviors	0.085	0.118	0.075	0.476
Educational Growth	0.451	0.149	0.333*	0.004
Waterway Attachment	0.638	0.162	0.433*	0.000

Note. B = unstandardized regression coefficient; SE_B = standard error of the coefficient; *б* = standardized coefficient.

*$p < 0.01$

Discussion

Limitations

The research experienced normative limitations in utilizing surveys. The survey data collected was cross-sectional, limiting the data richness of the respondents' perceptions and if they changed over time. The alternative solutions of directly and/or longitudinally studying the survey participants' behaviors posed issues of difficulty and cost (Halpenny, 2010) and were outside the means and purview of this project.

Also, to best fit research and evaluation design, the survey was administered as a one-paged (front and back) paper copy with finite physical space to help with buy-in and minimize fatigue (Anastasi, 1976; Hinkin, 1995; Schmitt & Stuits, 1985; Schriesheim & Eisenbach, 1990). Since there were four components being analyzed and other points of interest such as demographics, three of the four constructs consisted of three items for

spatial purposes. Ideally, these constructs could still be expanded by at least one item as four to six items are suggested for most constructs (Hinkin, 1995). However, the three three-item constructs all resulted in acceptable Cronbach's α's and conferred with other research that as few as three items can result in adequate internal consistency reliabilities (Cook, 1981; Hinkin, 1995).

Outcomes

Place Attachment as a Function of Environmental Artwork. The data outcomes provided evidence that this installation functioned as an anchor to place as on average the overall population positively responded that the art piece supplied a means of place attachment to the waterway. An underlying explanation for this could be that the art installation was compelling enough to attract people as curiosity was the main reason people selected for why they stopped and engaged. The visual aesthetic of the piece was pertinent to how normative, convenient, single-use personal items contribute to mass plastic consumption. The location and accompanying signage content presented water bottle litter as another environmental issue with a local waterway focus and then expanded into a larger scope. Thus, the artwork framed a general environmental issue by highlighting personal and local importance to the audience. This type of approach enhances personal relevancy of the message which is suggested by Maio and Haddock (2007) to be more persuasive.

Message processing capacities are increased when personal relevance corresponds (Maio & Haddock, 2007). Thus, environmental issues presented in a local framework may be more concrete, digestible, and understandable to an audience (Scannell & Gifford, 2013). The outcomes further support that these posits of insightfulness and

tangibility behind this type of messaging style are valid as nearly half (46%) of respondents were neutral to not familiar with the displayed educational topic but overall were affirmative on the installation's educational value. The descriptive data results affirmed that the installation's messaging mode did result in awareness building and place attachment and aligned with Scannell and Gifford's (2013) research regarding climate change messaging that information receptivity may be improved by locality.

The importance of highlighting relevancy in messaging aspects also relates with pro-environmental behaviors. Outcomes showed on average people responded that the experience positively affected their environmental behavior intentions. Environmental education research shows that increased pro-environmental behaviors have a higher likelihood of resulting from messages that employ emotive ties towards an object or setting than solely knowledge-based messages (Pooley & O'Connor, 2000). As place attachment is generally defined as a meaningful bond between a person and their environment (Low & Altman, 1992) the data was further explored to understand if this attachment predicted pro-environmental intentions.

Place Attachment as a Function of Environmental Behaviors and Intentions. Compelling evidence was provided by the regression model that place attachment predicts people's environmental behaviors. Specific to this research, the art as a conduit for people's connection to the waterway was the greatest statistically significant predictor of encouraging people's general environmental behaviors. These results align with Halpenny's (2010) findings where place attachment was a strong predictor for both place-specific and general pro-environmental behaviors, with little difference seen between the intentions' composite mean scores. The proposed explanation behind why general

environmental behaviors are predicted by place attachment is that as people build connection to nature-based contexts, these individual's natural setting attachments may transform into a commitment to the environment (Halpenny, 2010; Vaske & Kobrin, 2001). "In short, individuals may transfer the importance they assign to the place they love and value to the more abstract concept of the environment, increasing the possibility of their engagement in environmentally-responsible behaviors as a result" (Halpenny, 2010, p. 417).

Halpenny (2010) referenced that a weakness to their model on pro-environmental outcomes could be that they did not test for pro-environmental behavior predisposition. For this research, a construct regarding individual's baseline environmental behaviors was analyzed but was not found to contribute greatly or significantly to the intended environmental behavior prediction model. These outcomes, while surprising, may highlight that this research was not exhaustive on all factors that may affect the main constructs yet still provides an overarching view of carry-over affects from place attachment.

While the baseline environmental behavior construct did not statistically add to the prediction model, the overall descriptive results provided detail that the audience was not environmentally apathetic. Also, responses to the qualitative baseline question of what something is that respondents already do that helps our environment showed that most people already have some form of pro-environmental behavior as most people gave an answer(s). The population's current actions are in general more accessible, for example recycling can be done both at home and within the larger society due to municipality resources. However, intended/ideal actions showed a shift in themes from

preserving energy (reactive) to creating energy (proactive), such as wanting to use solar panels, as well as more emphasis on transportation changes. The desired actions people would like to take are arguably less accessible and/or more challenging to convert to due to societal restrictions and/or economic limitations. Regardless, listed intended and desired behaviors showed answers that were shifting from reaction-based to solution-oriented for environmental problems.

These results are compelling as another study found that the effect of sense of place was greater when the pro-environmental act was more demanding. Two-hundred-fifty-eight outdoor recreationists participated in a study when they visited a Canadian national park by answering survey questions regarding aspects of sense of place and environmental intentions. The researchers found that their construct for volunteer intention, which was considered the most demanding act, had the largest regression coefficient (Walker & Chapman, 2003). Thus, it is arguable that when sense of place is at play, more intensive actions may occur or stem from these connections. While one experience with a piece of art may be difficult to argue that all the people who interacted with it will make a greater environmental commitment, it is worth pointing out that multiple interactions over time with interventions that utilize place attachment may help to create those more intensive and purposeful behaviors.

For example, Walker and Chapman (2003) postulate that "interpretive programs could be designed that accentuate sense of place and, as a consequence, such programs could affect visitors' pro-environmental intentions and, potentially, their behaviors as well." The pro-environmental behaviors examined by this research were contextualized through accessible, urban community spaces and more akin to places people experience

every day with an ability to view a typical space with a messaging mechanism via an art installation. The positive outcomes and intents assessed previously help to further articulate why interventions which inspire place connection are "… important for understanding how connections to place translate to behaviors with consequences for sustainability" (Scannell & Gifford, 2010b, p. 291).

Conclusion

The environmental art exhibit, A Thousand Bottles, was meant to construct the landscape in a new way to bring attention to the Indianapolis waterways and enlightenment about issues the waterways face. The data from the two Indianapolis community events revealed emerging themes of the artwork producing environmental issue awareness and waterway attachment, as well as potential perception and behavioral change towards the environment and waterways. This research is important as it is analyzing a mode of utilizing art to raise awareness and educate the public about their local waterways and environmental issues. Indianapolis has a rich waterway history that has shaped its current environmental, political, and social motivations. Awareness needs to be brought to Indianapolis' waterways so that they can be better utilized as assets to their surrounding communities. The outcomes of this research highlight the importance of organizations promoting environmental awareness and action in a local context. This is just one case where a local urban issue in Indianapolis contributes to a global scale problem and why understanding how individuals and groups learn about environmental issues or if they do is key to informing on methods to pursuing local and global sustainability appropriate messaging and actions.

Chapter Four

Project Three – Cultivating Sense of Place in Urban Farm Environments Through Place-Based Experiential Learning

Introduction

Butler Project

Connecting disciplinary content to real-world issues is key to addressing the gap between what is taught in the classroom and how to translate these concepts into meaningful, civic action. Butler University's Center for Urban Ecology and Sustainability (CUES) is exploring the use of food system concepts through urban farm place-based experiential learning (PBEL) modules to engage students in practical research, stimulate environmental awareness, and enhance scientific literacy and civic-mindedness. The urban farm PBEL modules augmented a four to six-week portion of students' course curriculum in a twofold manner. Agricultural subject matter relevant to disciplinary content was taught within a traditional classroom setting, while the discourse was also conceptually actuated on an urban farm through hands-on research applicable to prominent societal concerns (Angstmann et al., 2019).

Project's Larger Relevance

As society has narrowed naturalistic intelligence towards a consumeristic utility (Gardner, 2008), a consumer's purchasing power via their product choices has also increased in importance to global resource usage, a predominant and multi-faceted problem within the larger food system. A refocus on small-scale, sustainable agriculture has been gaining momentum over the past 20 years, and its benefits, such as decreasing

'food miles', improving the local economy, and reconnecting farmers with consumers (McClintock, 2010), are becoming more known.

The larger relevancy of Butler's farm-situated PBEL curriculum is further highlighted by Indianapolis containing more than 20 urban farms, 134 urban and community gardens (Purdue Extension, 2019), and, central to this study, the CUE Farm, a sustainable, urban farm, located directly on Butler's campus. An urban farm provides a place of narrative to which the students can anchor in regards to how a global culture and economy can affect place locally (Gruenewald, 2003). By fostering students' interactions within actual food systems through their respective disciplinary content, it is arguably possible for students to create a deep understanding of content, while simultaneously addressing the need for a sustainability literate population prepared to better address complex ecological themes (Gruenewald, 2003; Huckle et al., 1996; Sobel, 1995). By connecting socio-ecological experiences of a campus farm to global food system phenomena students are better able to construct a personal and socially relevant place that has meaning and inspires action (Gruenewald, 2003).

PBEL and Sense of Place

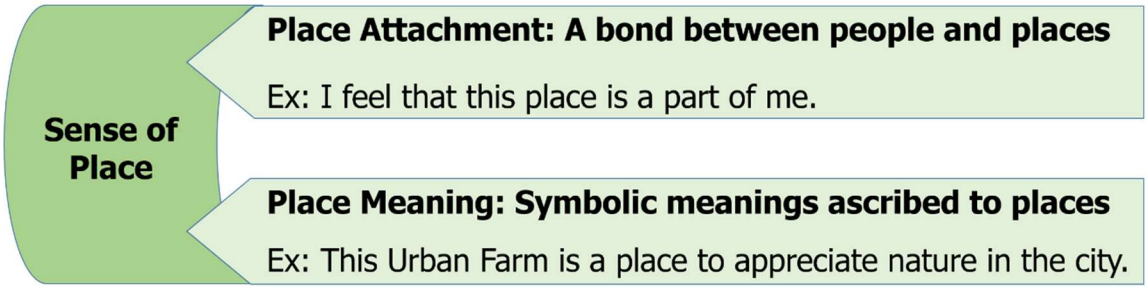
According to Gruenewald (2003), "Place-based pedagogies are needed so that the education of citizens might have some direct bearing on the well-being of the social and ecological places people actually inhabit" (p. 3). Encounters that result in knowledge creation positioned within tangible places provide an anchor for sense of place to occur. A sense of place results when an attachment is imbued through experience and meaning is ascribed to the setting (Relph, 1976; Tuan, 1974). Thus, PBEL provides a pedagogical

framework to facilitate a complex connection of people and place resulting in the potential for sense of place to be impacted.

Utilizing a similar lens as other literature, sense of place for this research was considered and quantitatively analyzed as concepts of place attachment and place meaning (A Kudryavtsev et al., 2012; Semken & Freeman, 2008; Semken et al., 2009; Stedman, 2002, 2003b). However, similar to Solin (2010), utilizing these two constructs for sense of place is to aid in organization and not considered as an absolute summation of a very diverse and integrated phenomenon. The varied range, blend, and salience of sense of place (Low & Altman, 1992; Scannell & Gifford, 2010a, 2010b) are evident via qualitative methods collection. To conceptually summarize sense of place for this project for measurable quantitative methods (Figure 4.1), a breakdown of place attachment and place meaning definitions follows.

Figure 4.1

Sense of Place Aspects and Type of Survey Questions Used to Measure Constructs



Note. Figure adapted from work of Kudryavtsev, Krasny, et al., 2012.

Sense of Place: Place Attachment and Place Meaning

A significant amount of the literature consists of efforts to define place attachment and its multi-faceted nuances. Moreover, it "has been criticized by many as being 'messy'" (Trentelman, 2009, p. 196). The following definition provided for place

attachment, however, provides good reason as to why different meanings have evolved and are of importance pending disciplinary interest. According to Low and Altman (1992), "The word 'attachment' emphasizes affect; the word 'place' focuses on the environmental settings to which people are emotionally and culturally attached" (p. 5). Hence, struggles to singularly define the multi-dimensional aspects of sense of place are to be expected as salience in differences for person, place, and process varies (Low & Altman, 1992; Scannell & Gifford, 2010a, 2010b). Place in a literal or figurative manner can have a number of scales, but for the sake of this research the place in question is a clearly demarcated geographical physical area that hosts an urban farm.

While place attachment has many theoretical definitions, the place attachment survey used in this study generalizes attachment as a single construct of two sub-constructs, place dependence and place identity (Williams & Vaske, 2003). Place dependence utilizes items that measure functional attachment and "…concerns how well a setting serves goal achievement given an existing range of alternatives" (Jorgensen & Stedman, 2001, p. 234) through the settings' attributes (Jorgensen & Stedman, 2001; Stokols & Shumaker, 1981; Vaske & Kobrin, 2001; Williams & Vaske, 2003). Place identity is considered an emotional attachment and a reflection of self-identity (Proshansky et al., 1983; Vaske & Kobrin, 2001; Williams & Vaske, 2003). In other words, a sense of self-formed through involvement with places visited (Williams & Patterson, 1999).

Place attachment concerns the social construction of sense of place, while place meaning exemplifies the "what" by describing the ascribed symbolic meanings of a physical environment's aspects (A Kudryavtsev et al., 2012; Stedman, 2003a, 2003b).

While multiple meanings permeate, “place meaning is always contextually bound to the place itself” (Semken et al., 2009, p. 140). Place meaning considered for this study examines the dimension of the urban farm setting’s physical characteristics. Thus, to center in on the sustainable urban farm’s attributes, sustainability’s constructs of ecological, economic, and social were utilized. More significance was given to the ecological component as pro-environmental behaviors may be more pertinent to a place’s natural setting (A Kudryavtsev et al., 2012; Scannell & Gifford, 2010b; Stedman, 2003b).

Sense of Place Inspiring Environmentalism

Place researchers’ extant literature presents that pro-environmental intentions or behaviors can be attributed to sense of place aspects (Halpenny, 2010; A Kudryavtsev et al., 2012; Ramkissoon et al., 2013; Scannell & Gifford, 2010b, 2013; Stedman, 2002; Vaske & Kobrin, 2001; Walker & Chapman, 2003). Vaske and Kobrin (2001) and Kudryavtsev, Krasny, et al. (2012) place studies reviewed youth programs whose set-ups were similar to this research’s length of time (four to six-weeks) but more time-intensive per the day and week. One analysis on the effect of place attachment for youth who participated in natural-resource-based local work programs (five to seven weeks) found that encouraging connectivity to a natural setting can influence environmentally responsible behavior (Vaske & Kobrin, 2001). Another study on environmental education interventions for Bronx youth found that short, but intensive programs (five to six weeks, 24 hours per the week) can increase ecological place meaning significantly; more specifically, it may increase participant perception regarding “the importance of nature in the local urban setting” (A Kudryavtsev et al., 2012, p. 9).

Despite these findings, there is limited scholarship in how educational interventions might affect sense of place in an urban locale (A Kudryavtsev et al., 2012). Also, while place-based learning set in gardens has been explored in the K-12 realm (see Miller, 2007; Morgan et al., 2009; Rahm, 2002) and utilizing farms to bolster sustainable agriculture curriculum has been reviewed (Cory-Watson, 2014; LaCharite, 2015; Rojas et al., 2007), there is limited empirical research and evidence on higher education agricultural based-learning outcomes (LaCharite, 2015). This research will address the aforementioned gaps by investigating how, if at all, students increase their sense of place when their disciplinary course work is embedded within the context of an urban farm. The central research questions for the PBEL module interventions are:

- Can a four to six week-long urban farm PBEL module measurably affect aspects of sense of place?
- Are differences in PBEL module intervention and/or implementation reflected in sense of place outcomes?
- Do students describe an intent to act pro-environmentally as a result of the modules and their changes in sense of place?

Methods

Three data acquisition methods were utilized to evaluate the PBEL modules' outcomes: surveys, focus groups, and course observations. Each is described in further detail below. The different data types all with the intent to describe the same phenomena resulted in a mixed methods triangulation design (Plano Clark & Creswell, 2008). This work explores the sense of place results, specifically towards an urban farm.

PBEL Intervention

Two lead course instructors created PBEL modules utilizing urban farms for a portion of their semesters' curriculum for four to six-week durations. One course was a second-year biology course, comprised of three sections, and ultimately taught by three different professors and utilized the CUE Farm. Only one professor (Section 2) designed the urban farm PBEL module and was meant to be the lead for the other two professors. The biology course conducted field data gathering activities on the CUE Farm for soil respiration and arthropod diversity experiments. The resultant data analyses and the course content was supposed to link the students' data outcomes into land management practices of the CUE Farm as well as urban ecosystem health.

The second course was an environmental studies course, which consisted of one section and used both the CUE Farm and another urban farm in Indianapolis. The environmental studies course assigned student groups to one of the two farms for participant-observation and interviewing of urban farmers. The students' qualitative research and site visits were supposed to connect the course's conceptual food systems theories into tangible experiences. Both courses participated in the same introductory activities designed to explore aspects of sustainability's three main components: ecological, economic, and social. These activities consisted of watching the documentary *Fresh* (Joanes, 2009), a farm sensory walk activity, and carbon footprint diet homework (Angstmann, 2017). All students interacted with the CUE Farm for the sensory walk introductory activity. Both courses implemented for the first time in fall 2017.

Data Collection

During the first week of the fall semester, students from all participating classes were recruited by the project's researchers to take part in surveys and informed about focus groups. Those students who signed the IRB consent forms and agreed to participate were sent pre- and post-surveys. An inclusive list of all the surveys sent includes an adapted Test of Scientific Literacy Skills (TOSLS) (Gormally et al., 2012), adapted civic-mindedness survey (Steinberg et al., 2011), adapted place attachment survey (Williams & Vaske, 2003), and developed place meaning survey.

The pre-surveys were implemented within the first two weeks of class and post-surveys were sent two weeks before the end of the semester. Classes were visited during the last ten minutes of lecture for both pre- and post-survey requests. Then, emails were sent to the consenting students from Qualtrics with follow-up emails at five and ten days later. Focus group recruitment occurred during the post-survey request. Students were asked to sign a form passed around the class if they were interested in participating. Students who signed the form were then sent an email to schedule a time outside of class to meet as a group. Course observations occurred whenever the PBEL module was being taught to measure applied implementation fidelity by each instructor based upon the project's pedagogical framework and observation protocol (Angstmann et al., 2019).

Instruments

Sense of place was constructed by two measurable variables of place attachment and place meaning. The core questions for both place attachment and place meaning were based on five-point Likert scales which helped to assess between moderate and strong feelings (Spector, 1992).

Place Attachment Survey. An adapted twelve item place attachment survey (Williams & Vaske, 2003) measured students' attachment to Butler University, where students call home, and their appropriate urban research farm (see Appendix C for Instrument: Urban Farm Place Attachment Survey). Students answered the same questions for each place while considering the different locations. The place attachment survey can be further reduced to subconstructs of place identity and place dependence (Williams & Vaske, 2003). The following results are strictly concerned with the PBEL modules urban farm interventions and urban farm place attachment outcomes, but the other two locations' surveys were reviewed for overall outliers for analysis purposes.

Place Meaning Survey and Development. I developed a place-meaning survey specifically for this project's urban farm locale with the design based on relevant literature for place meaning scales (A Kudryavtsev et al., 2012; Stedman, 2002, 2003a; Young, 1999). The place meaning survey was created to understand students' perceptions towards local urban farms as there was no easily adaptable or developed survey instrument for this purpose. The top-level framework of the twenty-item Likert scale place meaning survey was based upon sustainability's core concepts of economic, social, and ecological, with the ecological highlighted.

The psychometric measure of place meaning was also developed through interviews with three key informants who worked, promoted, and visited the CUE Farm on a regular, if not daily, basis to create content validity (Adams & Lawrence, 2015; Semken et al., 2009). These three informants consisted of the CUE Farm Manager, CUE Farm lead intern, and CUES Director. Questions posed to the key informants were adapted from Kudryavtsev, Krasny, et al. (2012) regarding nature-related settings and

activities appropriate for urban farms, as well as Young (1999) regarding the importance of and personal feelings towards the urban farm. Content analysis revealed overlapping descriptors between respondents and other referenced surveys (A Kudryavtsev et al., 2012; Stedman, 2002), and these were utilized for final scale items (see Appendix C for Instrument: Urban Farm Place Meaning Survey).

Survey Analysis Methods. Both pre- and post-place attachment and place meaning surveys were explored through a principal component analysis (PCA) to confirm variable-reduction and reliability with the student population. Due to population size, PCAs were only performed on the combined population ($n = 49$) (Yurdugül, 2008) utilizing Samuels' (2015) technical report procedure for reliability analysis with small samples via SPSS. Internal consistency was calculated for place attachment and place meaning using Cronbach's α. A Cronbach's α of ≥ 0.70 was used to base acceptance (Adams & Lawrence, 2015; DeVellis, 2016; Kline, 2005). Repeated measures analysis for the module intervention was explored through pre- and post-place-attachment and meaning surveys. The combined population, each course, and course sections were analyzed via paired *t*-tests along with effect size and power.

The scaffolding of the survey breakdown was to better address potential differences between instructor implementation and align focus group and course observation outcomes appropriately so that the data could be triangulated, particularly for the biology course since there were three instructors each teaching a section. Calculations were performed via SPSS V. 25 (SPSS Inc., 2017) and G*Power 3.1 (Faul et al., 2009) accordingly.

Focus Groups

The student focus groups were directed through a structured focus group protocol and pertinent probing questions during the discussion (Bernard, 2006). Questions covered all the project's variables of research interest including sense of place perceptions (see Appendix C for Focus Groups Module Implemented Questions). All focus group data was reviewed initially for sense of place aspects. Thematic coding was utilized to determine any emergent themes from the highlighted sense of place data (Braun & Clark, 2006). The focus groups provided an instrument to allow for contextual data collection and more specific environmentalism outcomes due to the students' interactions with the PBEL urban farm module.

Applied Program Fidelity and Course Observations

Observational field notes on the four classes were collected for each class and urban farm meetings throughout the PBEL module. Members of the research team conducted most of the observations. Other observers, comprised of Advisory Board Members for the project, picked at least one meeting of either course to observe during both semesters. After the semester, all observation notes were compiled. Utilizing these notes and their observations, researchers assigned fidelity of implementation scores to each section by an observation protocol. The observational protocol was designed by taking the criteria for each thematic area of the PBEL pedagogical framework (Angstmann et al., 2019) and applying a five-point Likert scale from 'Not present' (score = 0) to 'Excellent' (score = 4) to all items. The outcomes considered for this research were each instructor's overall fidelity score and best practices score. The fidelity score comprised the core criteria of the framework that both the design and implementation of

the module should have met while the best practices score covered core criteria and highly recommended criteria.

Results

Surveys

Removed Data Due to Inconsistencies. Only data for students who participated in both the pre- and post-sense of place surveys were kept for data analyses. Out of this matched population, two students' data were removed due to inconsistencies. One student responded that Butler University was 'Home' yet responded 'No' when asked a second time if they had considered Butler University to be home in the prior question. Both sections had completely different rankings to the same questions considering Butler University for place attachment. Although this particular data is not under review for this Chapter, the inconsistencies made the participant's responses questionable enough for removal. The other student removed had data that came up as an outlier in their respective class for place meaning and all three place attachment pieces: where they considered home, Butler, and urban farm. When their data was further reviewed, they had marked 'Strongly Disagree' for every item on all three places considered in the post-place attachment survey and 'Disagree' for all items on the post-place meaning survey. Their pre-sense of place surveys did not have similar answers.

Population Characteristics. Students' gender, ethnicity, and level in college information was provided by the institution. The predominant characteristics of the combined population consisted of white females at the sophomore college-level (Table 4.1). The breakdown of characteristics by course and section shows that the environmental studies course (one section) had students ranging from first year to senior,

with the majority of responding students identifying as female in the upper levels of junior and senior (Table 4.2). The biology course sections combined consisted predominantly of students identifying as female, sophomores. However, Section 3 has a closer 1:1 ratio in gender with 30% of its population associating as juniors (Table 4.3).

Table 4.1

Characteristics of the Overall Population by Gender

Gender	Female	Male
Total	35	14
Ethnicity		
American Indian	1	0
Asian	2	0
Black	1	0
Hispanic	2	0
White	28	14
Two or more	1	0
Student level		
First-year	3	2
Sophomore	20	7
Junior	8	3
Senior	4	2

Table 4.2

Characteristics of the Environmental Studies Course (1 Section) by Gender

Gender	Female	Male
Total	13	6
Ethnicity		
American Indian	1	0
Asian	0	0
Black	0	0
Hispanic	1	0
White	11	6
Two or more	0	0
Student level		
First-year	2	2
Sophomore	2	2
Junior	5	2
Senior	4	0

Table 4.3

Characteristics of the Biology Course (3 Sections) by Gender

	Section 1		Section 2		Section 3	
Gender	**F**	**M**	**F**	**M**	**F**	**M**
Total	10	1	7	3	5	4
Ethnicity						
American Indian	0	0	0	0	0	0
Asian	2	0	0	0	0	0
Black	1	0	0	0	0	0
Hispanic	0	0	1	0	0	0
White	7	1	5	3	5	4
Two or more	0	0	1	0	0	0
Student level						
First-year	1	0	0	0	0	0
Sophomore	8	1	7	2	3	2
Junior	1	0	0	0	2	1
Senior	0	0	0	1	0	1

Campus Urban Farm Awareness for Courses Combined. The pre-place attachment and meaning surveys contained initial questions regarding the students' previous knowledge of and interaction with the CUE Farm on Butler's campus. Of the cohort who responded to the sense of place surveys (49 students), 93.9% (46 students) knew that Butler had an urban farm, but only 38.8% (19 students) of students had previously visited the CUE Farm. The post-survey had follow-up questions on students' intent to continue to interact with an urban farm. On the post-survey, 89.8% (44 students) responded affirmatively (yes and maybe) that they intended to interact with the CUE Farm or another urban farm in the future. For the students who answered with an absolute 'Yes' (32.7%), the majority responded that their intentions were to either intern or volunteer. Most students, 89.6% (43 students), also answered affirmatively (yes and maybe) that they would come to visit the CUE Farm if on a visit to Butler's campus after graduating.

Sense of Place Surveys' Scale Validation and Reliability. To validate the place attachment and place meaning survey scales, PCAs were calculated. The urban farm pre-place attachment survey's first eigenvalue was > 6 (7.214) and accounted for 60.11% of the total variance (see Appendix C: Table C1). Six of twelve items had component loadings of > 0.8 and the reverse coded item, "The things I do at this place I would enjoy doing just as much at a similar site.", was the only item with a loading < 0.4 (-0.608) (see Appendix C: Table C2). The urban farm post-place attachment survey resulted in a top eigenvalue of 7.693, accounting for 64.11% of the total variance (see Appendix C: Table C3). Ten of the twelve items had > 0.8 values for their component loadings, while the reverse coded item was again the only item to have a component loading < 0.4 (-0.529) (see Appendix C: Table C4). After removing the reverse coded item, the urban farm pre-place attachment first eigenvalue was > 6 (6.879) accounting for 62.53% of the total variance (see Appendix C: Table C5). Six of eleven items had component loadings > 0.8 and no items had component loadings < 0.4 (see Appendix C: Table C6). For urban farm post-place attachment without the reverse coded item, the PCA resulted in a > 6 first eigenvalue (7.440) that accounted for 67.64% of the total variance (see Appendix C: Table C7). Ten of the eleven items had component loadings ≥ 0.8 and none were < 0.4. (see Appendix C: Table C8)

The adapted place attachment survey (Williams & Vaske, 2003) contained two sub-constructs: place identity and place dependence. The sub-construct place dependence contains the reverse coded question. Reliability scales for place identity and place dependence with and without the reverse coded item were calculated based on the PCA outcomes. Pre-place identity (α =0.902) and post-place identity (α = 0.932) were

acceptable, while pre-place dependence (α = 0.676) and post-place dependence (α = 0.680) were not. Removal of the reverse coded item "The things I do at this place I would enjoy doing just as much at a similar site." resulted in the Cronbach's α for pre-place dependence (α = 0.920) and post-place dependence (α = 0.876) increasing into the acceptable range of ≥ 0.70 (Adams & Lawrence, 2015). The place identity and reassessed place dependence constructs calculated together as pre-place attachment (α = 0.937) and post-place attachment (α = 0.950) resulted in acceptable internal consistencies (Table 4). Thus, due to scale validation and reliability outcomes, the reverse coded item was removed for all ensuing repeated measures analyses.

In addition, the designed urban farm place meaning survey was explored through a PCA. For the urban farm pre-place meaning survey, the first eigenvalue was > 6 (9.665) and accounted for 48.33% of the total variance (see Appendix C: Table C9). Only one item was < 0.4 (0.337) for its component loading (see Appendix C: Table C10). For the urban farm post-place meaning survey, the first eigenvalue was > 6 (11.084) accounting for 55.42% of the total variance, and no items had component loadings of less than < 0.4 (see Appendix C: Table C11 and C12). For reliability testing, Cronbach's α for pre-place meaning (α = 0.937) and post-place meaning (α = 0.952) were acceptable as well (Table 4.4).

Repeated Measures Analyses for Courses Combined. Paired-samples *t*-tests compared changes in urban farm sense of place scores pre- and post-module. For testing the normal distribution of urban farm place attachment and urban farm place meaning samples, Shapiro-Wilk tests were conducted. Results showed their *p*-values were statistically not significant ($p > 0.05$), and thus normally distributed. Urban farm place

attachment had no outliers. Urban farm place meaning had one outlier. After reviewing the raw data, the outlier case was kept due to responses showing nothing unusual. Also, removing the outlier did not create a change in outcomes for the urban farm place meaning dependent *t*-test. The outcome remained statistically significant at the same level for a one-tailed *t*-test, $p < 0.01$.

For final combined population, a statistically significant increase in place attachment was found between the pre-implementation (M = 27.55, SD = 7.14) and post-implementation scores (M = 32.43, SD = 9.17); $t(48) = -4.56$, $p < .001$ for a one-tailed *t*-test. Additionally, a power of 0.998 and an effect size of 0.65 were calculated for this population of students. There was also a statistically significant increase in scores for place meaning pre-implementation (M= 82.96, SD= 9.96) to post-implementation (M = 86.84, SD = 10.21); $t(48) = -3.135$, $p < 0.01$ for a one-tailed *t*-test with a power of 0.926 and an effect size of 0.45 (Tables 4.4 and 4.5).

Table 4.4

Combined Courses' Survey Outcomes for Sense of Place

			Pre-Module			Post-Module		
Courses Combined		***n***	**Mean**	**SD**	**α**	**Mean**	**SD**	**α**
Sense of Place	Urban Farm Place Attachment	49	27.55	7.14	0.937	32.43	9.17	0.950
	Urban Farm Place Meaning	49	82.96	9.96	0.937	86.84	10.21	0.952

Table 4.5

Combined Courses' Paired t-Test Results for Sense of Place

Paired *t*-Test Courses Combined		*t*	*df*	*p* (one-tailed)	Power	Effect Size (Cohen's *d*)
Sense of Place	Urban Farm Place Attachment	-4.556	48	0.000	0.998	0.65
	Urban Farm Place Meaning	-3.135	48	0.0015	0.926	0.45

Urban Farm Sense of Place Survey Outcomes by Course. As described in the PBEL intervention methods section, the combined population consisted of two different courses, biology, and environmental studies. Each courses' overall PBEL modules aimed for differing discipline objectives and data collection methods. Thus, to better understand how each style of course may have affected a sense of place towards an urban farm, a breakdown of the survey outcomes for each course follows.

Biology Course: Scale Reliability. For the biology course, comprising of all three sections, internal consistencies analyzed as Cronbach's α for pre-place attachment (α = 0.951), post-place attachment (α = 0.939), pre-place meaning (α = 0.916), and post-place meaning (α = 0.951) were acceptable (Table 4.6).

Biology Course: Repeated Measures Analyses. A paired-samples *t*-test was conducted for students in the biology course to compare changes in urban farm sense of place scores over time. Shapiro-Wilk tests showed that urban farm place attachment and place meaning were normally distributed ($p > 0.05$). No outliers were present for the biology course's three sections combined for either sense of place constructs.

When student outcomes were analyzed by respective course, the biology course's three sections together showed a statistically significant difference in place attachment.

The biology students' pre-implementation scores (M = 25.53, SD = 7.22) increased for post-implementation scores (M = 29.07, SD = 8.71); $t(29) = -2.531$, $p < 0.01$ for a one-tailed test with a power of 0.797 and an effect size of 0.46. All biology students showed statistically significant difference in place meaning results from pre-implementation (M = 81.40; SD = 8.67) to post implementation (M = 84.23, SD = 10.72); $t(29) = -2.159$, $p < 0.05$ for a one-tailed t-test with a power of 0.678 and effect size of 0.39 (Tables 4.6 and 4.7).

Table 4.6

Biology Course (3 Sections) Survey Outcomes for Sense of Place

			Pre-Module			Post-Module		
Biology Course/All Sections		***n***	**Mean**	**SD**	**α**	**Mean**	**SD**	**α**
Sense of Place	Urban Farm Place Attachment	30	25.53	7.22	0.951	29.07	8.71	0.939
	Urban Farm Place Meaning	30	81.40	8.67	0.916	84.23	10.72	0.951

Table 4.7

Biology Course (3 Sections) Paired t-Test Results for Sense of Place

Paired *t*-Test Biology Course/All Sections		***t***	***df***	***p* (one-tailed)**	**Power**	**Effect Size (Cohen's *d*)**
Sense of Place	Urban Farm Place Attachment	-2.531	29	0.0085	0.797	0.46
	Urban Farm Place Meaning	-2.159	29	0.0195	0.678	0.39

Environmental Studies: Scale Reliability. For the environmental studies course, internal consistencies analyzed as Cronbach's α for pre-place attachment (α = 0.880),

post-place attachment (α = 0.937), pre-place meaning (α = 0.954), and post-place meaning (α = 0.937) were also acceptable (Table 4.8).

Environmental Studies: Repeated Measures Analyses. A paired-samples *t*-test was conducted for students in the environmental studies course to compare changes in time for urban farm sense of place scores. Shapiro-Wilk tests showed that urban farm place attachment and place meaning were normally distributed ($p > 0.05$). No outliers were present for this course for either sense of place constructs.

The environmental studies course resulted in a statistically significant difference in place attachment from pre-implementation (M = 30.74, SD = 5.86) to post-implementation (M = 37.74, SD = 7.29); $t(18) = -4.414$, $p < .01$ for a one-tailed *t*-test and a power of 0.995 with an effect size over 1.0. This course also showed a significant difference in place meaning from pre-implementation (M = 85.42, SD = 11.54) to post-implementation (M = 90.95, SD = 7.98); $t(18) = -2.276$, $p < .05$ for a one-tailed t-test with a power of 0.707 and effect size of 0.522 (Tables 4.8 and 4.9).

Table 4.8

Environmental Studies Course (1 Section) Survey Outcomes for Sense of Place

			Pre-Module			Post-Module		
Environmental Studies Course/Section		***n***	**Mean**	**SD**	**α**	**Mean**	**SD**	**α**
Sense of Place	Urban Farm Place Attachment	19	30.74	5.86	0.880	37.74	7.29	0.937
	Urban Farm Place Meaning	19	85.42	11.54	0.954	90.95	7.98	0.937

Table 4.9

Environmental Studies Course (1 Section) Paired t-Test Results for Sense of Place

Paired *t*-Test Environmental Studies Course/Section		*t*	*df*	*p* (one-tailed)	Power	Effect Size (Cohen's *d*)
Sense of Place	Urban Farm Place Attachment	-4.414	18	0.000	0.995	1.013
	Urban Farm Place Meaning	-2.276	18	0.0175	0.707	0.522

Urban Farm Sense of Place Survey Outcomes by Course Sections. As described in the PBEL intervention and survey analysis methods sections, the two courses consisted of four instructors. The environmental studies course consisted of one section taught by one instructor. The biology course consisted of three sections with each section taught by a different instructor. The other data collection methods of focus groups and observations, also broken down by section/instructor, revealed that approaches to the PBEL module via the biology course differed pending instructor. To triangulate the data between the three methods of data collection, survey outcomes were also analyzed by course sections. Since the environmental studies course only consisted of one section with one instructor, the course results function as the section results as well. See the above course results for the environmental studies section outcomes. The breakdown for the biology three sections' results provided below.

Biology Course, Section 1: Scale Reliability. For biology Section 1, internal consistencies analyzed as Cronbach's α for pre-place attachment (α = 0.930), post-place attachment (α = 0.882), pre-place meaning (α = 0.906), and post-place meaning (α = 0.968) were also acceptable (Table 4.10).

Biology Course, Section 1: Repeated Measures Analyses. A paired-samples t-test was run for biology Section 1 to compare changes in urban farm sense of place scores. Shapiro-Wilk tests showed that the urban farm place attachment and place meaning results were normally distributed ($p > 0.05$). For urban farm place attachment and place meaning, Section 1 had no outliers.

When the student outcomes were analyzed by the respective section, biology Section 1 did show an increase in sense of place construct means from pre- to post-implementation (Table 10). However, these changes were not statistically significant for place attachment or place meaning (Table 4.11).

Table 4.10

Biology Course, Section 1 Survey Outcomes for Sense of Place

			Pre-Module			Post-Module		
Biology Section 1		***n***	**Mean**	**SD**	**α**	**Mean**	**SD**	**α**
Sense of Place	Urban Farm Place Attachment	11	26.09	6.64	0.930	30.18	6.90	0.882
	Urban Farm Place Meaning	11	81.64	7.39	0.906	83.00	10.67	0.968

Table 4.11

Biology Course, Section 1 Paired t-Test Results for Sense of Place

Paired *t*-Test Biology Section 1		***t***	***df***	***p* (one-tailed)**	**Power**	**Effect Size (Cohen's *d*)**
Sense of Place	Urban Farm Place Attachment	-1.388	10	0.0975	0.363	0.418
	Urban Farm Place Meaning	-0.527	10	0.305	0.124	0.158

Biology Course, Section 2: Scale Reliability. For biology Section 2, internal consistencies analyzed as Cronbach's α for pre-place attachment (α = 0.991), post-place attachment (α = 0.953), pre-place meaning (α = 0.927), and post-place meaning (α = 0.955) were also acceptable (Table 4.12).

Biology Course, Section 2: Repeated Measures Analyses. A paired-samples *t*-test was conducted for biology Section 2 to compare changes in urban farm sense of place scores. Shapiro-Wilk tests showed that the urban farm place attachment and place meaning results were normally distributed ($p > 0.05$) for Section 2. For urban farm place attachment, Section 2 contained two outliers. Reviewing these two students' raw data did not show any oddities in response outcomes, and they were not outliers for place meaning. Also, when all three sections of the biology course were analyzed in combination (see above), these students' data outcomes were not outliers for the larger group population. With these considerations as well as the already challengingly small population sizes for each section, the two outlier data points were kept for the following analyses. For urban farm place meaning, Section 2 had no outliers.

Biology Section 2 also showed an increase in sense of place construct means from pre- to post-implementation (Table 4.12). However, these changes were not statistically significant for place attachment or place meaning (Table 4.13).

Table 4.12

Biology Course, Section 2 Survey Outcomes for Sense of Place

			Pre-Module			Post-Module		
Biology Section 2		***n***	**Mean**	**SD**	**α**	**Mean**	**SD**	**α**
Sense of Place	Urban Farm Place Attachment	10	25.40	8.40	0.991	28.30	8.54	0.953
	Urban Farm Place Meaning	10	80.80	9.95	0.927	84.10	12.49	0.955

Table 4.13

Biology Course, Section 2 Paired t-Test Results for Sense of Place

Paired *t*-Test Biology Section 2		***t***	***df***	***p* (one-tailed)**	**Power**	**Effect Size (Cohen's *d*)**
Sense of Place	Urban Farm Place Attachment	-1.262	9	0.120	0.316	0.399
	Urban Farm Place Meaning	-1.585	9	0.0735	0.429	0.502

Biology Course, Section 3: Scale Reliability. For biology Section 3, internal consistencies analyzed as Cronbach's α for pre-place attachment (α = 0.928), post-place attachment (α = 0.964), pre-place meaning (α = 0.930), and post-place meaning (α = 0.934) were also acceptable (Table 4.14).

Biology Course, Section 3: Repeated Measures Analyses. A paired-samples *t*-test was run for biology Section 3 to compare changes in urban farm sense of place scores. Shapiro-Wilk tests showed that the urban farm place attachment and place meaning results were normally distributed ($p > 0.05$). For urban farm place attachment, Section 3 had no outliers. For urban farm place meaning, Section 3 had one outlier. Upon review, the student's data did not appear to have any discrepancies and was not an outlier for

place attachment. Also, when all three sections of the biology course were analyzed in combination (see above), this student's data outcomes were not outliers for the larger group population. With these considerations as well as the already challengingly small population sizes for each section, this outlier's data points were kept for the following analyses.

Biology Section 3 did show a statistically significant increase. Place attachment significantly increased from pre-implementation (M = 25.00, SD = 7.35) to post-implementation (M = 28.56 SD = 11.45); $t(8) = -1.877$, $p < 0.05$ for a one-tailed *t*-test and a power of 0.529 with an effect size of 0.626. The biology Section 3 course also showed a significant increase in place meaning from pre-implementation (M = 81.78, SD = 9.59) to post-implementation (M = 85.89, SD = 9.66); $t(8) = -1.918$, $p < 0.05$ for a one-tailed t-test with a power of 0.543 and effect size of 0.639 (Tables 4.14 and 4.15).

Table 4.14

Biology Course, Section 3 Survey Outcomes for Sense of Place

			Pre-Module			Post-Module		
Biology Section 3		***n***	**Mean**	**SD**	**α**	**Mean**	**SD**	**α**
Sense of Place	Urban Farm Place Attachment	9	25.00	7.35	0.928	28.56	11.45	0.964
	Urban Farm Place Meaning	9	81.78	9.59	0.930	85.89	9.66	0.934

Table 4.15

Biology Course, Section 3 Paired t-Test Results for Sense of Place

Paired *t*-Test Biology Section 3		*t*	*df*	*p* (one-tailed)	Power	Effect Size (Cohen's *d*)
Sense of Place	Urban Farm Place Attachment	-1.877	8	0.0485	0.529	0.626
	Urban Farm Place Meaning	-1.918	8	0.0455	0.543	0.639

Focus Group Outcomes

The student focus groups helped to highlight the survey outcomes by providing richer data into what, how, or why sense of place increases occurred – or did not. Environmental intentions from interacting with an urban farm were also highlighted. The outcomes are broken down based on course section.

Environmental Studies Course/Section: PBEL Introductory Activities. Initial modes of anchoring to place and students ascribing meaning to place were noted through how the students discussed their PBEL module's introductory activity experiences and thoughts. Students spoke about how the documentary *Fresh* (Joanes, 2009), shown during class time, contextualized topics being learned in class. As one student stated, "…I liked to see it actually being played out. I thought that was really cool." Another student discussed how *Fresh* (Joanes, 2009) helped them understand that "…things can kind of turn around and you can make better choices" tying in their own urban farm experience by stating "…and I think going to the Farm kind of reinforced that."

For the sensory walk, students were assigned to perform this activity outside of class time with a few focus group participants admitting they did not perform it and based it from memory. Some students felt the activity was a hassle and/or repetitious based on

their own experiences both at this farm or others. Yet, I noticed that some of these same students disclosed that once they performed the activity, they noticeably ascribed place meaning to their resisted experience. As one mentioned, "but then when I got down there it was really nice and peaceful, saw some cool birds and stuff so afterward I was really happy I did it." Another student who found the activity repetitive also admitted, "…it was nice just to be down there and everything with minimal noise and just paying attention to like the area and your surroundings I guess." Regardless of the criticism, students recognized the usefulness of the sensory walk for others who had never visited the farm or been anywhere like it. The students who rarely if ever visited the CUE Farm or an urban farm found the activity to be an effective avenue of initial exposure. For example, one student explained that:

> …listen and see and take a couple of seconds to kind of try to connect with it or write down what you are thinking during your experience is important especially when we go down to research—it's not something we've ever seen before. It's just kind of like unfamiliar ground for us.

The third introductory activity was a carbon footprint activity that was designed to provide a bigger picture for students to better understand their own current food choices and these choices potentially larger effects. As one student reflected:

> I feel like that is the biggest thing for me to learn in that class because everything else is like I kind of knew about it, but I had no idea about like your carbon footprint of your food and stuff like that.

While the students' comments about the carbon footprint activity did not directly revolve around a place, it did inspire thought towards actions and how these actions could affect a place.

Environmental Studies Course/Section: PBEL Module Research. For the overall research portion of the urban farm module, utilizing an urban farm provided an

applicable foundation for students to anchor their course concepts. As one student mentioned:

> …there is a whole lot more on the policy side that we kind of talked about broadly in class. I didn't realize the specific effects of it until I went to a small urban farm and we talked about how government could be influencing or not.

I also noticed another mode of place connection was how people functioned as anchors to the urban farm, both indirectly and directly. The instructor for this course never went to any of the urban farms with the students yet still engaged the students to learn more about their experiences. More specifically, as one student described the instructor:

> …and we are having to go to these farms, and so he really does want to know anything he has in his class is affecting your personal life. Like, if you are making better food choices or it not, he wants to know if what he is teaching is having any sort of effect on you as a person not just because you have to know it for class. He wants to know if it is helping you grow.

In a more direct application, another student explained how an urban farmer was helping them to connect:

> I guess it sparked more of an interest in like working with people more…I thought it was really cool just talking to him [Farmer Tim, CUE Farm Manager] and seeing how much he knew about farming which was insane. We asked him one question and he talked for like 20 minutes. I just think conversations like that are really cool and just getting information from different types of people in like one system and how much of a different experience they have.

Application of research through an urban farm as "place" also provided a concrete location to situate actions, as another student stated, "It was easy to like see the class in the farm and transform that into second part of class and how you can fix it with changing certain things like interpretation is straightforward. Like you are actually there – tangible." Being able to relate these actions to a place also guided the students to

understand their roles in the food system better, as one student mentioned, “I think definitely just like opens your mind up even more of where the food is coming from and the different processes that go into that.” A more specific concept that students concluded centered on that even small changes can create larger systemic changes. As one student stated:

> It was like hey, there are a lot of bad things happening to our environment and there are a lot of things that us as one person can’t control, but there are these little tiny things that we can do, and they lead into bigger things that make an overall positive impact.

Another student described:

> …but learning about - like we talk about these problems in class and they seem so big and like how are we going to fix this and then it comes back to there are ways that we can go about doing that like with just starting small, like advocating, like how the CUE Farm does. So, I think just connecting to what we are doing to a real place is cool.

These course concepts and place connections through the research module also provided the students with a mode of understanding the importance of their autonomy as consumers and their purchasing power within the food system. For example, a student spoke about how their connections increased from their research module as:

> From being on the CUE Farm, I knew they had a farm stand on Thursdays. It just kind of made me more aware when I like went into like a Jewel or a Kroger. I felt more like connected to and wanting to buy just like whole foods just because like I was surrounded by the people who planted the food and took care of it and there was a community there…it made me become more connected to the produce outside of the farm as well.

The urban farm module research also affirmed students’ current sustainable behaviors. As one student said, “….I’m vegetarian so I’m aware of what I’m eating and how it affects like the food systems but I guess it just kind of emphasized on my current decisions already, and I learned more about them professionally.” I noticed students were

compelled to identify intended, future actions such as, “pushing for change in ag policy and farm policies” and “make local and whole-food more available.” One student identified potential future actions to the place they may end up by claiming:

> I don’t know where in the world I’m going to end up for most of my life but wherever that is I would like to either start or be a part of something like Growing Places Indy or the CUE. Something in a local community since that gives back to the people who are living there.

Biology Course, Section 1: PBEL Module Introductory Activities. Students were requested to watch the documentary *Fresh* (Joanes, 2009) on their own time. In this course section, only one student referred to the video during the focus group, briefly identifying it as a larger picture for the role sustainable farms like the CUE Farm play “for the greater good.” The sensory walk was performed as a class with the focus group participants mentioning they would have preferred to have performed the activity by themselves. As one student stated, “It would have been nice to take more time and actually see and hear things,” another one added, “Take a moment to experience it…” Another student mentioned they would not have done it at all had they not performed the activity in class.

Biology Course, Section 1: PBEL Module Research. For Biology course, Section 1, minimal language for sense of place towards their urban farm research site was identified, but reasons for this absence were explained. One obstacle indicated by the students was a lack of context in tying the research they were performing back to the coursework and urban farm. Even if the students identified what they observed in their research, the conclusion was, “We didn’t really do anything with our data.” Another student discussed, “…we never actually talked about what soil had better respiration. We collected it, wrote it down, and handed it in, and never spoke of it again.” An obstacle I

found understandably hindering pointed out by the students was a lack of being on the farm. Students' replies to a question about experiencing attachment to the CUE Farm included, "I don't feel like we've been there enough.", "Not really because we didn't do much with the farm so I don't think we got much of the emotional connection. It was just kind of get in and get out." One student's suggestion for course improvement highlighted both deficiencies as:

> I think we need more information, more time to really process it because I felt like we got a lot of information upfront and never even visited it or like brought back ideas that we were learning and kind of connected with it.

Regardless, interest and curiosity about the urban farm were expressed by the students. For example, a student mentioned wanting to learn more through the people who worked on the farm, "I think it would be cool to like see them [Farm Manager and student interns] working or at least hear about what they do down there." and "I think it would be nice if the first time we went down there is we got to meet the farmers." The CUE Farm for this section's focus group attendees was also a newly discovered place on campus. A couple of students spoke about themselves and/or peers not realizing the CUE Farm existed on campus, as one admitted, "Honestly, I didn't even know there was a farm until this year."

Biology Course, Section 2: PBEL Module Introductory Activities. For the introductory activities, a few students spoke briefly about watching the documentary *Fresh* (Joanes, 2009) as it was assigned as homework. One of the students, in particular, found that *Fresh* (Joanes, 2009) helped to them to understand some of the course's research concepts and tied in the CUE Farm, "The *Fresh* video was very influential too, and then I really liked being out on the CUE Farm. I just think urban farming is a really

cool idea." The sensory walk was performed as a class and regarded as unimportant as the students mentioned: "not taking it seriously." Students admitted that they would have made it up if they had been assigned to do it on their own time.

Biology Course, Section 2: PBEL Module Research. For the biology course, section 2, students found it difficult to experience sense of place towards their urban farm research site as well due to lack of context in tying the research performed back to the farm and their coursework. When questioned about research results and the broader context for the urban farm research, students' predominant reply was "No. It's always we will do something next week with it, but it never comes – you just do something different." The students did desire this type of content as one explicitly stated:

> …I wish we would have developed this all more in class. Like, I could say the CUE Farm is an urban farm and urban farms are important, but we really didn't talk about it. The one thing we did talk about was how Indy is a really bad food dessert, but we pretty much said Indy is a really bad food dessert, and let's learn some statistics. So, the CUE Farm really specific to where we lived would have been really cool to discuss.

The obstacle of lack of time spent on the farm was also highlighted by another student stating, "And when we go in there it's like for a hot second." The importance of these obstacles hindering sense of place for the students was emphasized by this student's insight that "…if we can't understand the importance then you can't appreciate it."

I found that despite these obstacles, the urban farm research module did help increase appreciation for urban farms, specifically the CUE Farm. As one student mentioned, "I feel like I just have a lot more respect for it [CUE Farm]." I also noted recognition from the students in their roles as consumers and how urban farms play within the larger food system. This perception was emphasized by a student discussing the importance of shopping at local farms to "…know where all your food comes from."

This same student shared that they told their parents they should go to the CUE Farm Market and wanted to pursue an internship through the CUE Farm. For other potential behavioral changes from interacting with the CUE Farm and PBEL module, the same student whose respect had increased added, “It made me think where my produce comes from and how it impacts where I live and the necessary steps I can take and where some foods come from…so just knowing more about those things and taking action.”

Biology Course, Section 3: PBEL Module Introductory Activities. All three focus group participants from the biology course, section 3 mentioned watching the *Fresh* documentary (Joanes, 2009), which was assigned outside of class time. All three found it interesting and informative, with a couple of them speaking to how it made them realize they can make a difference themselves. As one student explicitly described, “That [*Fresh*] was a trigger for me that made me realize that this is something that we actually can do. I as one individual can make an effort to not destroy the environment quite as fast.” This same student discussed that *Fresh* (Joanes, 2009) conveyed “why the CUE Farm is so valuable”, but none of the students expressed how it tied into their course concepts even when directly asked.

The sensory walk was also performed as a class for this course section and these students did not find it useful with one student mentioning, “I didn’t get a whole lot of value out of it which I feel is a rather common sentiment of my class.” Out of all three biology sections focus group participants, this was the only section that a participant mentioned the carbon footprint activity but informed that they did not understand their outcomes.

Biology Course, Section 3: PBEL Module Research. Students in this section also found a lack of course concepts being tied into the context of the urban farm and research they were performing. One student mentioned they felt it was more important to understand how to use the buttons than "understanding the concepts and actual data." Another student added, "I don't know what I'm doing and why. I'm just regurgitating what [Instructor] showed me. I just know what I'm looking for and I don't know why I'm doing it at all." This same student also spoke of lack of data usage as "…but we never really did anything with it [data]. We took the quiz and then moved onto the next topic the next week in lab." The obstacle of a limited amount of time being spent on the CUE Farm also came up for this course section. Students mentioned "To be honest, I haven't been there enough to feel attached to it at all. It's just for short periods of time and all we're doing is collecting data…" and "My experience on it I feel was fairly limited." However, one student did mention enjoying the practical aspect as they were "able to actually see the research itself rather than be given a dataset."

Sense of place obstacles were similar for this course section as the other two sections, but there was a difference in what the students experienced on the CUE Farm during their data collection visits. The CUE Farm Stand occurred during the same time as their lab visits and during one of the collection times, the students went over to look. One student mentioned they "stuck around one day for the Farmer's Stand and that was really cool to see people from the community, not just Butler students." While another student mentioned, "[Instructor] wanted to buy peppers. [Instructor] dragged us all over there." Their exposure to the urban farm research module guided the students to identify future behavior intentions they would like to pursue. For example, one student expressed a

desire to shop at farmers markets after graduating from Butler, "I don't have a kitchen so it's not really applicable to me right now, but in the future, I think it's something that I will definitely keep in mind to shop at those kinds of things." Another student described their hope to implement a garden:

> …wherever I teach and then ideally have it be more like a farm stand …The CUE Farm kind of helped flesh that out to see that this is a thing that you can actually do, it's not a dream or anything.

Course Observations and Applied Program Fidelity

A total of 9 observers were utilized for 35 different class meetings across biology's three sections (15 observations) and environmental studies' one section (20 observations). The overall program fidelity implementation scores for each instructor is provided below (Table 4.16).

Table 4.16

Applied Program Fidelity by Instructor

Instructor	Biology Section 1	Biology Section 2	Biology Section 3	Environmental Studies
Fidelity Score	23/52	28/52	35/52	40/52
Best Practices Score	53/124	64/124	76/124	94/124

Besides the noted differences within the quantitative program fidelity scores, a more in-depth review of what specific observational differences between courses and sections is provided below.

Major Observational Differences: Amount and Quality of Time on an Urban Farm. Observational differences among courses and sections included the amount of time spent on the farm as well as the quality of the spent time. The environmental studies

instructor required students to spend at least four hours of research time on their respective urban farm (per the PBEL framework provided to all participating instructors). The students were placed into groups and assigned two, two-hour time blocks to perform participant observation and interviews on-site outside of class time and without supervision from the instructor. For participant observation, the students were directed in how (and why) to perform tasks of planting, harvesting, and preparing produce for the market (washing, weighing, bagging, etc.). The students based their open-ended interview questions on course readings and lecture materials. The students interacted directly with the urban farmers during both activities.

While all three sections of the biology course utilized the CUE Farm to collect data and perform fieldwork to educate on different sampling techniques, the amount and quality of time spent differed between sections. Section 1 and 2 instructors had their students on the farm for approximately half of the required time and never engaged with the Farm Manager or interns. In comparison, Section 3's instructor received an adequate score for time spent on the CUE Farm. Section 3's lab time coincided with the CUE Farmstand hours as well. When labs were spent on the CUE Farm, Section 3's instructor would engage their students with the market at the end of class, creating and enforcing connectivity. Many of the students from Section 3 were interested because quite a few were observed to stay and interact instead of choosing to go ahead and leave for the day.

Major Observational Differences: Debriefing and Cohesiveness of Course Concepts Back to Urban Farm Research. Observational outcomes for all three biology course sections noted a lack of debriefing and cohesive reasoning around the applied research experienced and conducted on the CUE Farm to broader conceptual importance.

Also, the required end of semester poster session or presentation was overlooked and made optional due to the oversight. Section 3's instructor had the most students participate in a cross-departmental poster session. Section 2's instructor had students make posters, but not present them. Section 1's instructor did not have their students participate. For environmental studies, the course concepts that aligned with the students' research projects were reiterated consistently. Also, the environmental studies instructor's students gave final in-class presentations on their research paper outcomes as a group to their peers and participating urban farmers.

Discussion

Limitations and Suggestions

Sample Size and Characteristics. Limitations of this research include the sample size for the statistical aspect and lack of diversity of the population. The sample size of the entire population for a total of 4 classes (2 courses) was below 50 (n = 49), with approximately 70% of the students identifying as female and about 86% as White. The data also needed to be considered by each course section due to multiple instructors and differing implementation. The biology course by section each had relatively small sample sizes for the number of students who took both the pre- and post-sense of place surveys.

Multiple Modes of Data Collection Necessary. When the combined population was analyzed via paired t-tests and a larger population, statistically significant sense of place outcomes resulted but based on focus group and course observation data this larger outcome does not agree or align with what truly happened during implementation and/or students' perceptions in their learning and engagement process. For this research, each course section's statistical outcomes showed a better alignment with the emerging trends

discussed through the other two data collection modes. Triangulating the data between surveys, focus group outcomes, and course observations for applied program fidelity scores creates a robust data set but requires more intensive amounts of time for data collection and analyses.

Biology: Faculty Variance and Course Suggestions. Limitations also existed in the faculty implementing. Three instructors taught one course increasing the complexity of what was or was not occurring in the urban farm PBEL module. The above results showed how the data was affected by the differences in implementation and potential guideline adherence challenges yet did show that the current instruments are catching these nuances. Solutions for biology to better align with guidelines would be to reassess the course's urban PBEL module in its entirety and ensure all instructors are involved in its design to ensure a higher level of ownership and communication. While this is normally a highly problematic suggestion to a multi-section course, it will be undergoing a complete overhaul by 2020 and so feasibly these suggestions could be strongly considered then if not earlier.

Environmental Studies: Course Suggestion. One suggestion for the environmental studies' module, even though most boxes were checked, would be to move the module to an earlier part of the semester versus the last third (late October – November timeframe). For the fall 2017 timeframe and weather, there were minimal issues, but proactively considering Indiana's variability in this realm, earlier would probably be better.

Sense of Place Surveys

As part of the scale validation process, a PCA was conducted on the combined population to confirm the place attachment survey and explore the place meaning survey. Assumptions from analyses regarding smaller population samples (n = 30 – 50) were used to consider the data outcomes (Samuels, 2015; Yurdugül, 2008). "If the value of that first eigenvalue of the sample data set is higher than 6.00, the sample coefficient α, even when n = 30, is an especially robust estimator of the population coefficient α" (Yurdugül, 2008, p. 403). To further analyze the surveys' particular items, a recommended removal value for component loadings of < 0.4 was utilized (Samuels, 2015).

The PCAs and reliability analyses on the urban farm pre- and post-place attachment surveys revealed that the reverse coded item, "The things I do at this place I would enjoy doing just as much at a similar site." should be removed for this research. (Walker & Chapman, 2003) and Halpenny's (2010) research support this deletion as they found it necessary to also remove the reverse coded item based on their place attachment results.

As the urban farm place meaning survey is still under design, no items will be removed at this time until a larger population's results are obtained to more comprehensively confirm statistical outcomes to an exploratory instrument (Dwyer et al., 2012). For this research's purpose, the initial results revealed a potentially highly reliable instrument and a new instrument that could be utilized by other sense of place researchers. In fact, (Semken & Freeman, 2008) found it is possible and necessary to create sense of place assessments for specific places.

Based on the above outcomes, all place attachment survey items and all place meaning survey items were each grouped into single scale variables. Both variables were analyzed via paired-samples *t*-tests to compare changes in sense of place over time. The layers of student populations were examined by providing a piece-by-piece analysis of all students combined, students by course, and students by section. When the student population was combined between all four classes, both place attachment and place meaning showed statistically significant increases. When the student population was analyzed by course, three sections of biology, and one section of environmental studies, both courses resulted in statistically significant increases in sense of place again. However, when analyzing the biology courses by their respective section (environmental studies remained the same as it was only one section), only Section 3 showed a trend of a statistically significant increase in sense of place over time.

The importance of acknowledging these population differences and which method is more relevant to larger outcomes is highlighted by further analyzing the other pieces of data collected that were specific to the course sections. The sections' statistical analyses provided the top-level quantitative purview of PBEL module implementation. Further differences between sections are reviewed through the focus groups as well as applied program fidelity and course observations outcomes.

Focus Groups

Comparison of Courses. Focus groups helped to outline what the students absorbed from the overall urban farm PBEL module, what affected sense of place avenues, and any resulting pro-environmental intentions and behaviors. The focus groups were of particular importance in providing in-depth research identifying specific

environmentally-responsible intentions and behaviors from an increased sense of place that other research has found to be limited in their methods (Halpenny, 2010).

Student conversations revealed that even differences within the introductory activities' implementation had effects on their sense of place experiences. For environmental studies, the introductory activities of watching *Fresh* (Joanes, 2009) in class and the performing the sensory walk outside of class helped to initiate sense of place aspects, while the carbon footprint homework showed broader relevance on how students' diets also affect larger systems, such as the carbon cycle. For biology, these introductory activities' applicability to their PBEL module was not translated as well. For feedback on the introductory activities, students in environmental studies realized the relevancy of *Fresh* (Joanes, 2009) to their course topics and urban farm visits versus biology students predominantly did not. Also, the sensory walk was better appreciated among the environmental studies students compared to the biology students who all performed the activity among their peers. The environmental studies students were critical of the exercise but when discussing the activity, they noticeably ascribed place meaning when describing their experience. For biology, the sensory walk activity seemed to result in a level of misdirected self-consciousness as they mentioned being very aware of their nearby classmates and what they were writing or doing versus focusing on the farm. Activities assigned outside of class time did result in some students who did not perform the activities as required, but this is always a risk with any outside of class assignment.

For the deeper research portion of the urban farm PBEL module, the environmental studies course learning material and discourse provided a theoretical

reference to the hierarchy and details of the different levels of food systems, while research on an urban farm helped to provide a concrete location for where and how these learned concepts could apply. Environmental studies focus group participants discussed how being on an urban farm made course concepts more tangible and understanding of issues and solutions more approachable. More specifically for this cohort of students, they relayed that this research module affirmed current, sustainable behavior, created intended future actions, and empowered them to take action and make changes now. This aligns with another study utilizing linear regressions on the sense of place surveys for pro-environmental intentions found that "the more "demanding" the pro-environmental act was, the greater the effect sense of place had" (Walker & Chapman, 2003, p. 81), which out of both courses the environmental studies had more time and labor-intensive exposure. The overarching sense of place aspects and encouraging pro-environmental intentions and behavior results are indicative of other research findings (Halpenny, 2010; A Kudryavtsev et al., 2012; Scannell & Gifford, 2010b, 2013; Stedman, 2002; Vaske & Kobrin, 2001; Walker & Chapman, 2003).

The urban farm PBEL module for the biology course contained activities that were meant to provide a space for students to identify how the utility of their research that requires micro-level analyses can be applied towards larger systemic topics, such as food systems. However, for the biology course overall, student comments occurred around not understanding the meaning of the outcomes from the collected and analyzed data, as well as the larger reasoning for the research due to no follow-up from the instructors. While the urban farm PBEL modules were meant to provide a place for the experience of course concepts, the concepts' theoretical reasoning still needed to have

instructional provision. These negative outcomes are concurrent with other literature concerned with minimal guidance, “Not only is unguided instruction normally less effective; there is also evidence that it may have negative results when students acquire misconceptions or incomplete or disorganized knowledge” (Kirschner et al., 2006, p. 84). Also, the participants discussed a lack of attachment to the CUE Farm due to a small amount of time being spent there.

Comparison of Course Sections. In comparing and contrasting the different focus groups’ outcomes, an important and consistent difference noticed between environmental studies and biology Section 3 to biology Section 1 and Section 2 was where they had a person’s guidance providing an anchor to the urban farm. For environmental studies, the instructor never stepped foot on the urban farm with the students but was still able to inspire through their in-class lectures by diligently connecting the concepts they were learning in class back to the urban farm as a place. Environmental studies students’ PBEL module also required they interact with the urban farmer by taking direction on what to do to work on the farm and then literally doing it, as well as semi-structurally interviewing the farmer on their thoughts about research concepts the students were learning in class. For biology Sections 1 - 3, all professors did visit the urban farm with the students. However, the difference for biology Section 3 was that beyond engaging the students in their research and data collection on the farm, this instructor also partook in the weekly farm stand looking for a type of pepper. This instructor also inadvertently connected the students in this way by taking them over to the farm stand that was adjacent to the farm, promoting a concrete purview of the farm’s community engagement through this market.

Considering the importance of a person to provide a means for encouraging sense of place, biology Section 1 students identified that a mode of exploring the CUE Farm more would be through the people who worked there, such as the Farm Manager and interns. This type of required guidance to emphasize sense of place outcomes is not novel and can be highlighted through Kudryavtsev, Stedman, et al.'s (2012) Venn diagram model where the two main sets in influencing sense of place are through experiential and instructional approaches. The union zone is called the "combined approach" which they believe "is an effective strategy to nurture place meaning and strengthen place attachment" (A. Kudryavtsev et al., 2012, p. 240). Yet, despite the lack of modes to connect, the focus groups for each biology course section showed that the PBEL module guided a heightened level of awareness as the students from biology Section 1 expressed curiosity, biology Section 2 demonstrated appreciation, and biology Section 3 perceived community engagement in regards to the CUE Farm.

Applied Program Fidelity and Course Observations

The course observations and applied program fidelity highlighted potential details as to why there were statistical differences between course sections and corroborated what the students were pointing out during their focus groups. Based upon both the fidelity and best practices scoring outcomes, fidelity to PBEL pedagogical framework and sense of place outcomes appear to parallel each other. The more the instructor adhered to the framework and received higher fidelity scores, the more likely their students' pre- to post-sense of place survey scores had a statistically significant increase.

Course implementation fidelity observations also called to attention implementation differences, which ended up being of particular importance for the

biology course with three different instructors implementing the curriculum. The breakdown of the framework concepts and details of the observations qualitatively and quantitatively gave insight into differences among courses and their sections implementation. Two important modes that appear to affect the PBEL module sense of place outcomes were *amount and quality of time* and *debriefing and cohesiveness of course concepts back to urban farm research*.

Triangulation

Aligning the courses and their sections' survey results, student focus group outcomes, and program fidelity scores with observation data highlighted facets that affect and promote sense of place within a PBEL module. The differences in the application are notable through the survey outcomes as environmental studies and biology Section 3 showed statistically significant increases in sense of place, both through the place attachment and place meaning instruments. The focus group data provided more detail to pro-environmental behavioral outcomes and defined an important means of understanding the multi-dimensional aspect of sense of place in the context of collegiate curriculum. More than simply placing students on or near the site of interest to collect their data is required. This outcome was indicated by the students' discussions highlighting the need of a person or some method of guidance (Kirschner et al., 2006) to provide support for attachment and increase meaning (A. Kudryavtsev et al., 2012). The applied program fidelity and course observations supported and underscored what implementation differences can do to an intervention's outcomes and spotlighted which aspects may need absolute adherence for efficacy in increasing sense of place.

Conclusion

Overall, while the biology course sections' triangulated data (surveys, focus groups, and course observations) revealed a number of challenges during implementation, the importance of this PBEL approach should not be overlooked in that it initiated a discourse among students to recognize that a sustainable, urban farm exists on their University's campus allowing them increased access to sustainable choices and behaviors. For environmental studies, students' sense of place increased towards their respective urban farms due to curricular intervention. This increase points to a nurtured, deeper bond developed through urban farms and exposure to food systems knowledge. More specifically, their focus group discussions showed higher regard for acting now and in their future in an environmentally responsible manner, particularly through the food system. The relevance of the discussed outcomes highlights in varying degrees what other extant literature claims about sense of place encouraging pro-environmental behavior but has had limited educational program examples to show as potential contributors and modifiers.

The urban farm PBEL module gave students a means to better understand how their choices within their current locale could affect a larger system as a whole through their coursework research, and also provided space for expansion of educational philosophies past a static classroom setting (Gruenewald, 2003; Woodhouse & Knapp, 2000). The intent was to connect the students to a place through their disciplines' concepts, specifically an urban farm. By increasing place attachment and meaning to an urban farm and exposure to food systems knowledge, students showed empowerment, consciousness, and action to be more civically engaged in sustainable behaviors both

personally and professionally as “eating is not only personal but also political” (Alkon & Agyeman, 2011, p. 2). The awareness the urban farm PBEL module may bring to the table could be exactly what students need to make more conscious consumer choices by acknowledging their purchasing power and thus, creating and sustaining proactive environmental behaviors.

Chapter Five

Conclusion

Environmental issues from anthropogenic effects such as excessive resource depletion and pollution have created seemingly inaccessible solutions, particularly when considered individualistically. These inadequacies stymie growth and encourage indifferent attitudes and behaviors. Another contributing factor is that our naturalistic intelligence has become embedded in capitalistic consumerism, helping to drive this resource disparaging (Gardner, 2008). As Gallup's environmental poll indicated, Americans believe that the environment's quality is declining (Newport, 2018) yet as Halpenny (2010) notes, most will not change their behaviors to improve the environment.

This research highlights some of these different modes of hindrances. For example, in Project One the analysis of the families' interviews pointed out perceived environmental action challenges that fit within a model of Blake's (1999) identifying three dominant categories of individuality, responsibility, and practicality. Blake (1999) categorizes individuality as "environmental concerns are outweighed by other conflicting attitudes" (p. 266). Kollmuss and Agyeman (2002) paraphrase Blake's category of responsibility as "people who don't act pro-environmentally feel that they cannot influence the situation or should not have to take the responsibility for it" (p. 247). Lastly, practicality includes those social and institutional constraints that pose as barriers to people's pro-environmental actions (Blake, 1999).

During the family interviews, discussions occurred around these levels of these hindrances such as laziness/lack of interest (individuality), lack of trust and lack of ownership (responsibility), and lack of facilities and lack of time (practicality). These

negative effects and parallels to past research are disconcerting as they show cultural relevance to today, over twenty years later, and highlight how difficult it is to challenge bad norms over time. Thus, how can people be confronted in such ways that stimulates action? For all three projects, a mixture of thematic content and surveys were assessed and analyzed to understand what exists for people to act more intentionally as knowledgeable, environmental stewards and what types of interventions are conducive to promoting better environmental awareness and behavior.

For the first project, aspects countering these hindrances were found to be present in the family interviews. For example, pro-environmental awareness was relevant as the families showed their differing knowledge and care regarding the prioritization list variables. While their environmental topic knowledge was different, the critical overlap was that families showed greater awareness and at times action towards variables if they were issues near their respective residences/homes and immediate surroundings. Thus, in close place proximity and relevancy. Also, addressing issues and acting was discussed as more accessible and not as overwhelming when viewed at a more grassroots level. As such, sense of place was important to consider as it may help to break down certain challenges to action barriers. This work examines sense of place as a conduit for creating an overarching understanding of what motivates people to act more environmentally responsibly.

As Scannell and Gifford (2010a) target environmental psychological processes they utilize the term place attachment instead of sense of place and present that the psychological process of place attachment is affect, cognition, and behavior, with affect producing an emotional connection. If as Gould (1994) states "…we cannot win this

battle to save species and environments without forging an emotional bond between ourselves and nature as well – for we will not fight to save what we do not love…" (p. 40), then in some circumstances a bonding which creates an emotional connection (Scannell & Gifford, 2010a) may help to overcome intrinsic and inherent limitations. Also, as Walker and Chapmen (2003) posit, positive relationships are reasonable expectations when considering someone's sense of place and pro-environmental intentions a person has towards that place.

As Project One showed, where someone lived, or areas nearby, more than likely already had those essential characteristics of creating some level of attachment and meaning. Projects Two and Three's research outlined how critical messaging and experiential aspects can be when utilized to draw attention and connection back to commonplace resources and their place in the larger environment and environmental issues. Projects Two and Three center attention on how these messages, in order to provide the utmost efficacy for environmental matters, need to have a focal point with place relevancy.

Project Two explored sense of place by employing art as an environmental education tool to produced means for individuals and communities to learn about, connect with, and attach to their waterway resources and a pollution issue that has far reaching effects. A family interviewed for Project One discussed how best to communicate impact and conversed around visuals and referenced the art exhibit Washed Ashore in Washington, D.C. (WashedAshore.org, 2019). To overlap with how art can be an important messaging mechanism to promote action, Project Two's research covered a similar type of installation with relevant signage, albeit on a much smaller scale than the

Washed Ashore exhibit. The survey outcomes provided compelling evidence through the regression model that this visual interpretation as a mode for people's place attachment to the waterways was the greatest statistically significant predictor of encouraging people's general environmental behaviors.

For Project Three, exposing students to PBEL modules via urban farms transcended the classic, static classroom setting and allowed for students to identify at a deeper level with their research and its applicability to broader, real-world problems and solutions. This research helped to further define important drivers behind people experiencing sense of place. The student course sections who showed statistically significant increases in sense of place through the surveys also had noticeable differences in course content implementation through observations and confirmed via focus group discussions. For the PBEL modules, method of guidance as well as place experience were necessary components. As Kudryavtsev, Stedman, et al.'s (2012) writing describe experiential and instructional approaches combined are the most effective strategy for promoting sense of place in an academic approach, however, this mode is also appropriate for a broader application of increasing sense of place through any style of intervention.

As noted via all three projects and their differences, viable solutions can and should be multi-modal as certain individuals will find different routes more effective and/or more in line with their preference of engagement. Inspirational and informative environmental learning avenues that could help provide mechanisms for the process of increasing sense of place can be diverse in approach allowing organizations and/or individuals a high level of freedom to create formative and salient experiences for

recipients. Environmental awareness and action raising interventions, regardless of informal or formal style, are necessary to attach society to the importance of the resources surrounding them, and the larger environment. As Orr attributes "the ease with which we miss the immediate and mundane. Those things nearest at hand are often the most difficult to see" (1992, p. 126). In an environmental context, resources such as local waterways and food-systems are often trivialized due to the necessary components of clean drinking water and groceries being part of our everyday landscape and easily obtained by many people.

Important Environmental Implications to Consider With Sense of Place

Due to climate change and adverse effects, needs for disaster recovery of areas will continue to increase (IPCC, 2018; USGCRP, 2018). Past research that delves deep and brings to the forefront this potential is Ninth Ward interview data collected from the residents (61% of research's interviewees) and an array of stakeholders post-Hurricane Katrina. The researchers interview data provides evidence that for early returnees, sense of place was an integral driver (Chamlee-Wright & Storr, 2009). While Chamlee-Wright and Storr (2009) are not strictly suggesting that only sense of place is the reason for return and recovery, they do "…hope to engage the literature concerning the relationship between sense of place and community engagement and the challenge of persevering, and where necessary restoring, a sense of place after a natural disaster" (p. 617). Rebuilding can take on many forms. For example, painting murals have been listed along with planting trees and gardens as a mode of recovery and restoration post-disturbance events (Fisher et al., 2015).

Past addressing local actions, sense of place is foundational for creating those first building blocks needed for pursuing essential steps to change larger systemic issues. From a broader lens, global systems are undergoing changes due to anthropomorphic climate change, and preparation for long-term future effects has become a necessity. International and intranational plans and agreements may help prioritize the environment, but action is what will change the final outcomes. Appropriate action requires people to be informed. Scannell and Gifford's (2013) research on climate change messaging is a good example of how sense of place interplays with wide-ranging and far-reaching environmental matters. Their work suggested that locality may help receptivity of climate change information. Thus, sense of place can better anchor individuals to finding their space within not only their own communities, but our global village.

Appendix A

Instrument: Issues Prioritization List

Please prioritize the following topics with 1 being most important and needing to be addressed:

Brownfields
- "A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." - EPA

Chemical Pollutants
- Agricultural (pesticides, fertilizers, etc.), industrial (heavy metals, pharmaceuticals, etc.), urban (oil, grease, etc.)

Combined Sewer Overflows (CSO's)
- A combined sewer is a wastewater system that carries both sanitary sewage and stormwater to an appropriate facility for treatment. During rain or snowmelt events, the collection system and treatment facility's capacity can be exceeded which causes overflow. The overflow is directed to nearby waterways.

Groundwater Pollution
- "Groundwater contamination occurs when man-made products … get into the groundwater and cause it to become unsafe and unfit for human use." –The Groundwater Foundation

Invasive Species
- "An invasive species can be any kind of living organism … that is not native to an ecosystem and which causes harm." -National Wildlife Federation

Litter
- "things that have been thrown away and that are lying on the ground in a public place" – Merriam-Webster

Urbanization
- "the process by which towns and cities are formed and become larger as more and more people begin living and working in central areas" –Merriam-Webster

Urban Heat Island Effect
- "As urban areas develop, changes occur in their landscape. Buildings, roads, and other infrastructure replace open land and vegetation. Surfaces that were once permeable and moist become impermeable and dry. These changes cause urban regions to become warmer than their rural surroundings, forming an "island" of higher temperatures in the landscape." -EPA

Urban Water Engineering
- Controlling flow of water for human agendas and purposes versus allowing the water to be natural

Other_____

Instrument: Solutions Prioritization List

Please prioritize the following topics with 1 being most important for addressing environmental and waterway issues and improvements.

Education
- More programming/interventions dealing with environment and waterway issues via schools, workplaces, and neighborhoods

Incentives
- Methods to promote/award persons who choose to participate in a more sustainable livelihood

Legislation
- Signing petitions, calling a legislature, voting, etc. pertaining to environment and waterway issues and improvements

Reduce, Reuse, Recycle & Composting

Riparian Habitat Restoration
- Riparian: relating to or living or located on the bank of a natural watercourse (Merriam-Webster)
- "…is a process that sets the stage to allow natural ecological processes to occur and to continue once the riparian habitat is reestablished" (Bureau of Land Management)

Environmental Stewardship
- Civic participation in maintaining and improving the environment

Urban Water Engineering
- Controlling flow of water for human agendas and purposes versus allowing the water to be natural

Please list 2-3 more topics that are important to you in how to address environmental and waterway issues and improvements:

Table A1

De-Identified Raw Data for Each Family Participant for the Issues Prioritization List

Family Participants	Prioritization Issue Topics								
	Brownfields	**Chemical Pollutants**	**Combined Sewer Overflows**	**Groundwater Pollution**	**Invasive Species**	**Litter**	**Urbanization**	**Urban Heat Island Effect**	**Urban Water Engineering**
A_1	4	1	5	2	8	9	6	3	7
A_2	5	4	3	2	6	1	7	8	9
B_1	3	1	7	2	6	4	8	5	9
B_2	2	3	1	4	5	6	7	8	9
C_1	4	2	3	1	7	6	9	5	8
C_2	3	2	4	1	5	6	7	8	9
D_1	8	3	6	2	5	4	9	7	1
D_2	7	4	5	6	2	1	3	8	9
E_1	5	1	4	2	8	3	7	6	9
E_2	7	3	2	5	4	6	8	9	1
E_3	5	3	1	2	9	6	4	8	7
F_1	3	1	7	2	9	6	8	4	5
F_2	3	2	5	1	7	6	4	8	9
F_3	6	2	1	5	4	3	7	9	8
F_4	6	2	5	1	4	7	3	8	9
F_5	6	1	5	2	7	3	4	9	8
G_1	9	2	3	7	4	8	1	5	6
G_2	5	3	6	4	8	7	1	2	9
H_1	6	4	1	2	3	9	7	5	8
H_2	5	3	8	4	6	2	9	7	1
H_3	5	9	4	1	2	3	8	6	7
Total	**107**	**56**	**86**	**58**	**119**	**106**	**127**	**138**	**148**

Note. Matching letters correspond to same family while subscript numbers identify individual family member response. Letters and subscript apply to same family member in solutions prioritization list.

Table A2

De-Identified Raw Data for Each Family Participant for the Solutions Prioritization List

Family Participants	Prioritization Solution Topics						
	Education	**Incentives**	**Legislation**	**Reduce, Reuse, Recycle & Composting**	**Riparian Habitat Restoration**	**Environmental Stewardship**	**Urban Water Engineering**
B_1	5	1	6	2	7	3	4
B_2	3	7	5	1	6	2	4
C_1	1	4	5	3	6	2	7
C_2	1	7	3	4	6	2	5
D_1	3	1	2	4	6	5	7
D_2	1	5	6	3	2	4	7
E_1	3	6	2	1	4	5	7
E_2	3	7	6	4	5	1	2
F_1	3	7	6	1	5	2	4
F_2	1	5	2	4	6	3	7
F_3	1	5	6	2	3	4	7
F_4	4	2	1	5	6	3	7
F_5	4	1	6	7	5	3	2
F_6	2	4	1	3	6	5	7
G_1	6	2	1	5	3	4	7
G_2	3	6	5	2	4	1	7
H_1	4	2	6	1	7	3	5
H_2	7	4	3	2	6	5	1
H_3	1	4	2	3	6	7	5
Total	**56**	**80**	**74**	**57**	**99**	**64**	**102**

Note. Matching letters correspond to same family while subscript numbers identify individual family member response. Letters and subscript apply to same family member in issues prioritization list.

Table A3

Other Topics Listed by Family Members

Prioritization Interview	'Other' Listed Topics to Address
Issues	Waste storage (landfills, chemical, nuclear, etc.) Impact of climate change Inequality Air pollution (global warming) Recycling science/improving process of recycling Light pollution Mutating and cloning things Accessibility to natural spaces Illegal dumping Dump BlueIndy cars; Get rid of BlueIndy More dams More bike trails
Solutions	Promote local waterways for recreation; Events on waterways Allow new developments for reservoirs Economics; Business partnerships Volunteering thru work/school Focus on your neighborhood/community (KIB) Addressing pollution & litter Improved accessibility to encourage 'investment' in maintaining safe, healthy waterways Factual information made public with frequent updates so it removes the rhetoric and provides scientific proof of impact Focus on tracking and enforcing regulations of industry that pollute our waterways More penalties ($ or others) for offenders - Stronger fines for companies that do not abide Stop fracking Run off from industry Trash/Chemical Dumping (prevent) Engineering green alternatives Replacement for capitalism-based geopolitics Dismantling the patriarchy Tie-ins to economics, community health, art installations Preservation of state and local parks Agriculture chemicals Sanitation & public health - Hazard & sewage disposal Cultural awareness – raising awareness via normal exposure in media rather than formal education Raise the minimum wage Not electing Trump Identify uses for large abandoned mfg plant sites/malls/businesses Government subsidies to pay for collecting recyclables instead of charging the people to recycle

Appendix B

Instrument: Perception Survey – Front Page

Please share your thoughts and experiences with the A Thousand Bottles installation at the Canal during Open Bite. The information you provide will help Reconnecting to Our Waterways (ROW) evaluate and improve its work along the waterways.

Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. It is very important for us to learn your opinions.

Your survey responses will be strictly confidential. If you have questions at any time about the survey or the procedures, you may contact Kelly Brown at metrics@ourwaterways.org.

Thank you very much for your time and support.

1. Why did you stop? (Select all that apply)
- ☐Piece is new to location/Unknown
- ☐Appearance _____
- ☐ Sound
- ☐Curiosity
- ☐Other_____

2. How did you engage with the piece? (Select all that apply)
- ☐Read sign
- ☐Physically engaged
- ☐Looked at it
- ☐Other_____
- ☐I did not engage

3. What caused you to engage with the piece? (Select all that apply)
- ☐Color
- ☐ Curiosity
- ☐ Nothing
- ☐ Kinetic/Movement
- ☐ Tactile/Touch
- ☐ Sound
- ☐ Signage

4. How often do you come by this area?[1]
- ☐Daily
- ☐At least once a year
- ☐At least once a week
- ☐Less than once a year
- ☐ At least once a month
- ☐Never

How much do you agree with each of the following statements?

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
Generally, an individual's actions are too small to have a significant effect on the environment.[2]	❑	❑	❑	❑	❑
I always consider the environmental effects of my actions.	❑	❑	❑	❑	❑
I feel responsible about current environmental problems.[3]	❑	❑	❑	❑	❑
I am willing to take action that might be out of my way to better the environment.[4]	❑	❑	❑	❑	❑

	Helpless/ Depressed	Sad	Indifferent	Happy	Ecstatic
When I think about all the environmental issues we face, I feel:[4]	❑	❑	❑	❑	❑

We would like to understand your perception of the installation and its purpose.

How much do you agree with each of the following statements?

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
I am aware that this piece is trying to educate me.	❑	❑	❑	❑	❑
I recognize that the piece has a deeper meaning.	❑	❑	❑	❑	❑
I am already familiar with the displayed educational topic.	❑	❑	❑	❑	❑
This piece expands my knowledge on the educational topic.	❑	❑	❑	❑	❑
This piece makes me think differently about the educational topic.	❑	❑	❑	❑	❑
This piece makes me want to learn more about the educational topic.	❑	❑	❑	❑	❑

PLEASE TURN OVER!

Instrument: Perception Survey Cont'd – Back Page

How much do you agree with each of the following statements?

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
This piece draws my attention to the waterway	❑	❑	❑	❑	❑
This piece makes me feel attached to the waterway.	❑	❑	❑	❑	❑
This piece gives me a way to connect to the waterway.	❑	❑	❑	❑	❑
This piece changes my perception of the waterway.	❑	❑	❑	❑	❑
This piece inspires me to be more aware of the environment.	❑	❑	❑	❑	❑
The piece makes me feel responsible about the environment.	❑	❑	❑	❑	❑
This piece makes me think about how I can help improve the environment.	❑	❑	❑	❑	❑
This piece makes me want to change my behaviors.	❑	❑	❑	❑	❑

What is something you *already do* that helps our environment?_____

What is something you *would like to do* to help our environment?_____

Please select the option that best reflects your involvement with Reconnecting to Our Waterways (ROW):

- ☐ Heard of it but know little about it.
- ☐ Sought out information about this organization (e.g. read newletter(s), visited website)
- ☐ Have attended community meeting(s), organization-sponsored events or programs
- ☐ Current or former member of ROW committee or working group
- ☐ Never heard of it.

Zip code_____ **How long (in years) have you lived in your neighborhood?** _____

How do you describe yourself?
Select all that apply

- ☐American Indian
- ☐Asian
- ☐Black/African American
- ☐Hispanic or Latino
- ☐White
- ☐Other _____
- ☐Decline

Age

- ☐ 18 to 24
- ☐ 25 to 34
- ☐35 to 44
- ☐ 45 to 54
- ☐ 55 to 64
- ☐ 65 and Over
- ☐ Decline

Annual household income (before taxes)

- ☐Less than $10,000
- ☐ $10,000- $19,999
- ☐ $20,000-$29,999
- ☐ $30,000-$39,999
- ☐ $40,000-$49,999
- ☐ $50,000-$59,999
- ☐ $60,000 -$79,999
- ☐$80,000 - $99,999
- ☐$100,000 and above
- ☐ Decline

Gender

- ☐Male
- ☐Female
- ☐ Prefer not to identify

Highest level of completed education

- ☐Grades 0-8
- ☐Grades 9-11
- ☐High School or GED
- ☐Some College
- ☐College Graduate
- ☐Post-College Degree
- ☐ Decline

Please provide your contact information (email or phone number) so you may be entered into a drawing for a $25 Kroger gift card. Your contact info will only be used for the purpose of notification if you win and will not be connected to your survey responses. Please leave blank if you prefer not to participate:

THANK YOU! For more information or to learn how you can get involved in ROW please visit ourwaterways.org

References Specific to Survey's Endnotes

[1] (adapted item) Coombes, E., Jones, A.P., & Hillsdon, M. (2010). The relationship of physical activity and overweight to objectively measured green space accessibility and use. *Social Science and Medicine, 70,* 816-822.

[2] Zhai, L., & Scheer, S. D. (2004). Global perspectives and attitudes toward cultural diversity among summer agriculture students at Ohio State University. *Journal of Agricultural Education, 45*(2), 39-51.

[3] (adapted item) Kaiser, F. G., Ranney, M., Hartig, T., & Bowler, P. A. (1999). Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *European Psychologist, 4*(2), 59-74.

[4] (adapted item) Maloney, M. P., Ward, M. P., & Braucht, G. N. (1975). Psychology in action: A revised scale for the measurement of ecological attitudes and knowledge. *American Psychologist, 30*(7), 787-790.

Table B1

Ethnicity Characteristics of the Surveyed Community Events (Multi-Response)

Ethnicity	Total	Pogue's Run Community Event	Canal Community Event
American Indian	3	3	0
Asian	0	0	0
Black/African American	13	1	12
Hispanic or Latino	4	4	0
White	39	33	6
Other	6	4	2

Table B2

Demographics of All Populations (Single-Response)

Characteristics	Total	Valid Percent	Pogue's Run Community Event	Valid Percent	Canal Community Event	Valid Percent
Gender						
Male	33	54.1	26	60.5	7	38.9
Female	28	45.9	17	39.5	11	61.1
Totals	61		43		18	
Age						
18 to 24	5	8.5	3	7.5	2	10.5
25 to 34	18	30.5	15	37.5	3	15.8
35 to 44	19	32.2	9	22.5	10	52.6
45 to 54	7	11.9	5	12.5	2	10.5
55 to 64	6	10.2	5	12.5	1	5.3
65 and over	4	6.8	3	7.5	1	5.3
Totals	59		40		19	
Income						
Less than $10,000	2	3.4	0	0	2	10.5
$10,000 - $19,999	4	6.8	3	7.5	1	5.3
$20,000 - $29,999	4	6.8	4	10.0	0	0
$30,000 - $39,999	9	15.3	5	12.5	4	21.1
$40,000 - $49,999	6	10.2	6	15.0	0	0
$50,000 – $59,999	9	15.3	8	20.0	1	5.3
$60,000 - $79,999	7	11.9	2	5.0	5	26.3
$80,000 - $99,999	4	6.8	3	7.5	1	5.3
$100,000 and above	8	13.6	6	15.0	2	10.5
Decline	6	10.2	3	7.5	3	15.8
Totals	59		40		19	
Education						
Grades 0 – 8	0	0	0	0	0	0
Grades 9 – 11	0	0	0	0	0	0
High School or GED	6	10.0	3	7.1	3	16.7
Some College	14	23.3	11	26.2	3	16.7
College Graduate	26	43.3	19	45.2	7	38.9
Post-College Degree	14	23.3	9	21.4	5	27.8
Totals	60		42		18	

Table B3

How Often Survey Participants Came by the Community Area Where Event Was Held

Response	Total	Valid Percent	Pogue's Run Community Event	Canal Community Event
Daily	8	12.9	4	4
At least once a week	1	1.6	0	1
At least once a month	9	14.5	8	1
At least once a year	16	25.8	12	4
Less than once a year	8	12.9	6	2
Never	20	32.3	12	8
Totals	62		42	20

Table B4

Participants' Responses to Why They Stopped to Interact With the Art Installation (Multi-Response)

Why did you stop?	Total	Pogue's Run Community Event	Canal Community Event
Piece is new to location/Unknown	21	15	6
Appearance	22	14	8
Sound	3	0	3
Curiosity	39	26	13
Other	5	5	0

Table B5

Participants' Responses to What Caused Them to Engage With the Art Installation (Multi-Response)

Response	Total	Pogue's Run Community Event	Canal Community Event
Color	7	7	0
Kinetic/Movement	2	2	2
Sound	1	1	0
Curiosity	60	41	19
Tactile/Touch	11	9	2
Signage	11	6	5
Nothing	1	0	1

Table B6

Participants' Responses in How They Engaged With the Art Installation (Multi-Response)

Response	Total	Pogue's Run Community Event	Canal Community Event
Read sign	48	35	13
Physically engaged	27	15	12
Looked at it	50	38	12
Other	4	4	0
I did not engage	0	0	0

Figure B1

Scree Plot for Visual Inspection of Component Retention

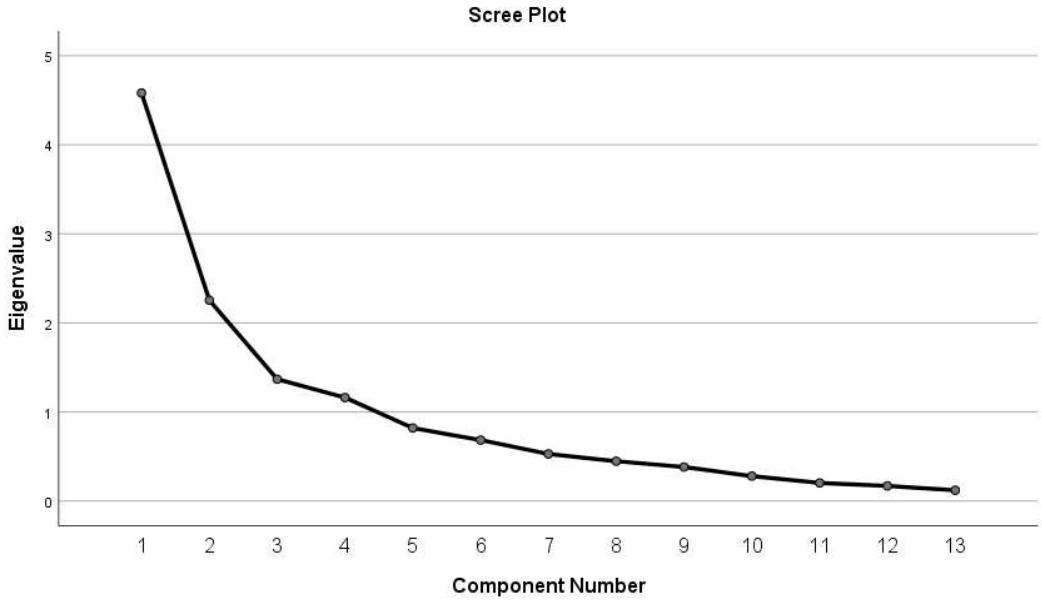


Table B7

Items' Component Loadings for Data Interpretation

Rotated Component Matrix[a]

	Component			
Survey Items	1	2	3	4
This piece makes me feel responsible about the environment.	**.908**	.096	.166	.057
This piece inspires me to be more aware of the environment.	**.866**	.055	.286	.193
This piece makes me think about how I can help improve the environment.	**.783**	.004	.246	.262
This piece makes me want to change my behaviors	**.531**	.045	.391	.351
I am willing to take action that might be out of my way to better the environment.	.128	**.919**	-.016	-.031
I always consider the environmental effects of my actions.	-.059	**.839**	.015	.048
I feel responsible about current environmental problems.	.074	**.802**	.068	.018
This piece makes me feel attached to the waterway.	.145	.073	**.878**	.111
This piece gives me a way to connect to the waterway.	.258	.128	**.704**	.060
This piece draws my attention to the waterway.	.305	-.135	**.665**	.027
This piece expands my knowledge on the educational topic.	.187	-.112	-.014	**.853**
This piece makes me want to learn more about the educational topic.	.024	-.021	.473	**.749**
This piece makes me think differently about the educational topic.	.301	.196	-.009	**.680**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Table B8

Components' Internal Consistencies for Scale Reliability

Component/Construct	Cronbach's α
Baseline environmental behaviors	0.812
Educational growth	0.742
Place attachment	0.765
Influence on environmental behavior	0.871

Table B9

Participants' Responses to: 'Generally, an individual's actions are too small to have a significant effect on the environment.'

Response	Total	Valid Percent	Pogue's Run Community Event	Valid Percent	Canal Community Event	Valid Percent
Strongly disagree	38	58.5	24	54.6	14	66.7
Somewhat disagree	15	23.1	12	27.3	3	14.3
Neither agree nor disagree	5	7.7	2	4.5	3	14.3
Somewhat agree	3	4.6	2	4.5	1	4.8
Strongly agree	4	6.2	4	9.1	0	0
Totals	65		44		21	

Table B10

Participants' Responses to: 'When I think about all the environmental issues we face, I feel:'

Response	Total	Valid Percent	Pogue's Run Community Event	Valid Percent	Canal Community Event	Valid Percent
Helpless/ Depressed	6	10.0	5	12.2	1	5.3
Sad	44	73.3	29	70.7	15	78.9
Indifferent	7	11.7	5	12.2	2	10.5
Happy	2	3.3	2	4.9	0	0
Ecstatic	1	1.7	0	0	1	5.3
Totals	60		41		19	

Table B11

Constructs' Aggregate Means by Population

	Total	Pogue's Run Community Event	Canal Community Event
Baseline Environmental Behaviors			
Mean	4.01	4.02	4.00
Educational Growth			
Mean	3.71	3.58	3.98
Place Attachment			
Mean	3.92	3.85	4.07
Influence on Environmental Behaviors			
Mean	4.02	3.90	4.28

Table B12

Thematic Coding (With Response Examples) for Topics Listed Regarding What Respondents Already Do to Help Our Environment

Topic – Past/Already Taking Action(s)	Total Responses for Topic	Pogue's	Canal
Reduce, reuse, recycle - Composting - Minimize waste production - Reusable containers - Recycle - Buy second hand clothing - Do not use plastic water bottles - Conserve water	42 (33)	29 (3)	13 (3)
Omitting chemicals	1	1	0
Clean-up - Pick-up trash (1) - Do not litter	7	4	3
Transportation change - Walk and ride bike - Gas saving car	4	2	2
Engage in sustainable hydroponic products at work	1	1	
Preserve energy - Air dry laundry - Lighting choices - Watch Power usage	4	2	2
Plant natives	1	1	0
Community development - Organize volunteers	1	0	1
Nothing	2	0	2
Total number of respondents	**54**	**36**	**18**

Table B13

Participants' Level of Acknowledgement for the Educational Aspect of the Installation

	Total	Valid Percent	Pogue's Run Community Event	Valid Percent	Canal Community Event	Valid Percent
I am aware that this piece is trying to educate me.						
Strongly disagree	1	1.6	0	0	1	4.8
Somewhat disagree	1	1.6	0	0	1	4.8
Neither agree nor disagree	3	4.7	2	4.7	1	4.8
Somewhat agree	23	35.9	20	46.5	3	14.3
Strongly agree	36	56.3	21	48.8	15	71.4
Totals	64		43		21	
I recognize that the piece has a deeper meaning.						
Strongly disagree	2	3.1	1	2.3	1	4.8
Somewhat disagree	0	0	0	0	0	0
Neither agree nor disagree	2	3.1	2	4.5	0	0
Somewhat agree	20	30.8	16	36.4	4	19.0
Strongly agree	41	63.1	25	56.8	16	76.2
Totals	65		44		21	
I am already familiar with the displayed educational topic.						
Strongly disagree	6	9.2	3	6.8	3	14.3
Somewhat disagree	12	18.5	9	20.5	3	14.3
Neither agree nor disagree	12	18.5	10	22.7	2	9.5
Somewhat agree	21	32.3	12	27.3	9	42.9
Strongly agree	14	21.5	10	22.7	4	19.0
Totals	65		44		21	

Table B14

Participants' Responses to: 'This piece changes my perception of the waterway.'

Response	Total	Valid Percent	Pogue's Run Community Event	Valid Percent	Canal Community Event	Valid Percent
Strongly disagree	2	3.1	1	2.3	1	4.8
Somewhat disagree	3	4.6	2	4.5	1	4.8
Neither agree nor disagree	28	43.1	21	47.7	7	33.3
Somewhat agree	21	32.3	11	25.0	10	47.6
Strongly agree	11	16.9	9	20.5	2	9.5
Totals	65		44		21	

Table B15

Thematic Coding (With Response Examples) for Topics Listed Regarding What Respondents Would Like to Do to Help Our Environment

Topic – Intentional Action(s)	Total Responses for Topic	Pogue's	Canal
More reduce, reuse, recycle	11	9	2
Transportation change - Battery car - Bike commute - Car emission conversion - Drive less	10	8	2
Clean-up	1	0	1
Preserving and creating energy - Home efficient - Solar panels - Rainwater harvesting - Garden	5	2	3
More cognizant and aware	4	2	2
I don't know	3	1	2
Volunteer	3	3	
Any and everything	1	0	1
Total number of respondents	**37**	**24**	**13**

Appendix C

Instrument: Urban Farm Place Attachment Survey

The urban farm place attachment survey was a modified version of Williams and Vaske (2003) place attachment survey and followed their subconstructs of place dependence and place identity. All odd number items are part of the place identity subconstruct and all even numbers are part of the place dependence subconstruct. The last item is a reverse coded item and was removed for this research due to analysis outcomes. All items were measured using a 5-point Likert scale.

Place Attachment Survey Instrument
Each of the twelve statements on this page refers to the Urban Farm you will be spending time on this semester (ex. Butler's CUE Farm). Please choose the option that best matches your own personal response to each statement: 1. I feel that this place is a part of me. 2. This place is the best place for what I like to do. 3. This place is very special to me. 4. No other place can compare to this place. 5. I identify strongly with this place. 6. I get more satisfaction out of being at this place than at any other. 7. I am very attached to this place. 8. Doing what I do at this place is more important to me than doing it in any other place. 9. Being at this place says a lot about who I am. 10. I wouldn’t substitute any other area for doing the types of things I do at this place. 11. This place means a lot to me. 12. The things I do at this place I would enjoy doing just as much at a similar site.

Instrument: Urban Farm Place Meaning Survey

The urban farm place meaning survey was developed for this project with created, adapted, and existing items. The survey below references which items were verbatim, indicated by the term *direct*, and which items were adapted, indicated by the term *adapted*. If neither of these terms follows the item, then the item was created. The two pieces of extant literature used are also included for easy reference and the items are denoted by an * or ** according to reference referral. All items were measured using a 5-point Likert scale.

Place Meaning Survey Instrument
The [urban farm] is a place….
1. to connect with nature. *direct 2. to watch wildlife. *adapted 3. where people can find nature. *direct 4. where farming is an important part of the community. *adapted 5. to find many species of wildlife and plants. **adapted 6. to value. 7. to see environmental action in practice. 8. to learn. 9. to observe eco-friendly food production. 10. to engage in taking care of the environment. 11. to experience nature in an urban environment. 12. to be in nature. 13. to gain knowledge about environmental matters. 14. to enjoy nature's beauty and peace. *adapted 15. to grow food. *direct 16. to support the local economy. 17. to contribute to social well-being. 18. to appreciate nature in the city. 19. to provide deeper meaning to social and economic food issues. 20. where people, plants, and wildlife interact as part of the natural environment within a city.
* Kudryavtsev, A., Krasny, M. E., & Stedman, R. C. (2012). The impact of environmental education on sense of place among urban youth. *ECOSPHERE, 3*(4), 1-15. ** Stedman, R. C. (2002). Toward a social psychology of place: Predicting behavior from place-based cognitions, attitude, and identity. *Environment and Behavior, 34*(5), 561 - 581.

Focus Groups Module Implemented Questions

1. What aspects of [X course] have you enjoyed the most? Least?

2. What are your academic and career goals?

2a. What specifically do you think draws you to this trajectory?

3. How has your feeling toward your academic career goals changed over time?

3a. Has [X course] or work on the CUE/appropriate research Farm influenced these changes? What aspects, How?

4. How confident are you in your capacity to design and implement a scientific research project?

5. How confident are you in your capacity to interpret data, produce results, and utilize those results to suggest changes in human practice?

5a. For example, how could you use your data to support the arguments presented in the Fresh Doc? Or for those of you who did not watch this – how could your data application support a broader context?

6. In your experience, do you interact with a place differently when you feel some sort of attachment to that place?

7. Since beginning course work on the CUE farm, have you experienced feelings of greater attachment to it? Or feelings of greater attachment to the environment, more generally?

7a. How did the sensory walk reflection and overall interaction with the CUE/appropriate research farm play into these feelings?

8. What does civic engagement mean to you?

9. In your experience, how does civic engagement occur or what does it look like?

9a. Where do you think these views come from?

10. How has civic engagement been portrayed in your courses?

10a. How has civic engagement been portrayed in regard to your experiences with the CUE/appropriate research farm?

11. In what ways do you think civic engagement is important to your own work and future work?

Focus Groups Module Implemented Questions Cont'd

12. What does it take to be a civic-minded professional?

12a. Do you have any examples?

13. Has your interaction with the CUE/appropriate research Farm affected the ways in which you want to interact with the community in the future (either personally or professionally)?

Table C1

Eigenvalues for PCA on Urban Farm Pre-Place Attachment Survey

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.214	60.113	60.113	7.214	60.113	60.113
2	1.396	11.636	71.749	1.396	11.636	71.749
3	.981	8.171	79.920			
4	.707	5.890	85.810			
5	.546	4.551	90.361			
6	.333	2.779	93.140			
7	.236	1.966	95.106			
8	.191	1.594	96.700			
9	.153	1.271	97.971			
10	.107	.891	98.862			
11	.078	.653	99.515			
12	.058	.485	100.000			

Extraction Method: Principal Component Analysis.

Table C2

Component Loadings for PCA on Urban Farm Pre-Place Attachment Survey

Component Matrix[a]

Each of the twelve statements on this page refers to the Urban Farm you will be spending time on this semester (ex. Butler's CUE Farm). Please choose the option that best matches your own personal response to each statement.	Component 1	2
I feel that this place is a part of me.	.838	-.053
This place is the best place for what I like to do.	.724	.471
This place is very special to me.	.731	-.459
No other place can compare to this place.	.773	.128
I identify strongly with this place.	.843	-.094
I get more satisfaction out of being at this place than at any other.	.856	.186
I am very attached to this place.	.828	-.087
Doing what I do at this place is more important to me than doing it in any other place.	.820	.441
Being at this place says a lot about who I am.	.754	-.148
I wouldn't substitute any other area for doing the types of things I do at this place.	.817	.387
This place means a lot to me.	.669	-.645
The things I do at this place I would enjoy doing just as much at a similar site.	-.608	.333

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

Table C3

Eigenvalues for PCA on Urban Farm Post-Place Attachment Survey

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.693	64.107	64.107	7.693	64.107	64.107
2	.978	8.152	72.260			
3	.733	6.108	78.368			
4	.574	4.786	83.154			
5	.531	4.422	87.576			
6	.381	3.173	90.749			
7	.313	2.609	93.358			
8	.258	2.147	95.505			
9	.243	2.023	97.528			
10	.137	1.140	98.668			
11	.090	.748	99.417			
12	.070	.583	100.000			

Extraction Method: Principal Component Analysis.

Table C4

Component loadings for PCA on Urban Farm Post-Place Attachment Survey

Component Matrix[a]

Each of the twelve statements on this page refers to the Urban Farm you will be spending time on this semester (ex. Butler's CUE Farm). Please choose the option that best matches your own personal response to each statement.	Component 1
I feel that this place is a part of me.	.801
This place is the best place for what I like to do.	.840
This place is very special to me.	.842
No other place can compare to this place.	.600
I identify strongly with this place.	.875
I get more satisfaction out of being at this place than at any other.	.844
I am very attached to this place.	.881

Table C4 Cont'd	
Doing what I do at this place is more important to me than doing it in any other place.	.813
Being at this place says a lot about who I am.	.809
I wouldn't substitute any other area for doing the types of things I do at this place.	.824
This place means a lot to me.	.865
The things I do at this place I would enjoy doing just as much at a similar site.	-.529

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Table C5

Eigenvalues for PCA on Urban Farm Pre-Place Attachment Survey Without Reverse Coded Item

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.879	62.533	62.533	6.879	62.533	62.533
2	1.339	12.174	74.708	1.339	12.174	74.708
3	.870	7.909	82.617			
4	.620	5.635	88.252			
5	.441	4.012	92.264			
6	.247	2.250	94.513			
7	.193	1.759	96.272			
8	.153	1.391	97.663			
9	.115	1.041	98.704			
10	.083	.756	99.460			
11	.059	.540	100.000			

Extraction Method: Principal Component Analysis.

Table C6

Component Loadings for PCA on Urban Farm Pre-Place Attachment Survey Without Reverse Coded Item

Component Matrix[a]

Each of the twelve statements on this page refers to the Urban Farm you will be spending time on this semester (ex. Butler's CUE Farm). Please choose the option that best matches your own personal response to each statement.	Component 1	2
I feel that this place is a part of me.	.841	.120
This place is the best place for what I like to do.	.728	-.479
This place is very special to me.	.732	.538
No other place can compare to this place.	.773	-.146
I identify strongly with this place.	.835	.076
I get more satisfaction out of being at this place than at any other.	.875	-.084
I am very attached to this place.	.825	.118
Doing what I do at this place is more important to me than doing it in any other place.	.835	-.398
Being at this place says a lot about who I am.	.740	.086
I wouldn’t substitute any other area for doing the types of things I do at this place.	.829	-.359
This place means a lot to me.	.656	.681

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Table C7

Eigenvalues for PCA on Urban Farm Post-Place Attachment Survey Without Reverse Coded Item

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.440	67.640	67.640	7.440	67.640	67.640
2	.875	7.958	75.598			
3	.603	5.485	81.083			
4	.534	4.857	85.940			
5	.381	3.463	89.402			
6	.336	3.052	92.454			
7	.282	2.560	95.014			
8	.246	2.238	97.252			
9	.139	1.266	98.518			
10	.090	.816	99.335			
11	.073	.665	100.000			

Extraction Method: Principal Component Analysis.

Table C8

Component Loadings for PCA on Urban Farm Post-Place Attachment Survey Without Reverse Coded Items

Component Matrix[a]

Each of the twelve statements on this page refers to the Urban Farm you will be spending time on this semester (ex. Butler's CUE Farm). Please choose the option that best matches your own personal response to each statement	Component 1
I feel that this place is a part of me.	.802
This place is the best place for what I like to do.	.840
This place is very special to me.	.847
No other place can compare to this place.	.597
I identify strongly with this place.	.884
I get more satisfaction out of being at this place than at any other.	.842

Table C8 Cont'd	
I am very attached to this place.	.885
Doing what I do at this place is more important to me than doing it in any other place.	.820
Being at this place says a lot about who I am.	.800
I wouldn't substitute any other area for doing the types of things I do at this place.	.830
This place means a lot to me.	.863

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Table C9

Eigenvalues for PCA on Urban Farm Pre-Place Meaning Survey

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.665	48.325	48.325	9.665	48.325	48.325
2	2.670	13.351	61.676	2.670	13.351	61.676
3	1.259	6.295	67.970	1.259	6.295	67.970
4	1.110	5.549	73.519	1.110	5.549	73.519
5	1.025	5.127	78.646	1.025	5.127	78.646
6	.919	4.593	83.239			
7	.578	2.892	86.131			
8	.481	2.406	88.537			
9	.380	1.898	90.435			
10	.344	1.721	92.156			
11	.317	1.585	93.742			
12	.293	1.464	95.206			
13	.235	1.177	96.383			
14	.199	.995	97.378			
15	.166	.831	98.209			
16	.122	.608	98.817			
17	.114	.568	99.385			
18	.054	.269	99.654			
19	.041	.207	99.861			
20	.028	.139	100.000			

Extraction Method: Principal Component Analysis.

Table C10

Component Loadings for PCA on Urban Farm Pre-Place Meaning Survey

Component Matrix[a]

The twenty statements on this page refers to the Urban Farm you will be spending time on this semester (ex. Butler's CUE Farm). Please choose the option that best matches your own personal response to each statement.	Component				
This Urban Farm is a place...	1	2	3	4	5
- to connect with nature.	.675	.397	-.257	-.282	.277
- to watch wildlife.	.337	.778	.150	-.126	.252
- where people can find nature.	.556	.626	-.313	.042	.060
- where farming is an important part of the community.	.690	-.002	-.189	-.015	.345
- to find many species of wildlife and plants.	.441	.624	.365	.132	.240
- to value.	.745	-.043	-.246	-.348	-.259
- to see environmental action in practice.	.756	.079	-.318	.326	-.162
- to learn.	.703	-.401	-.186	.184	.139
- to observe eco-friendly food production.	.686	-.572	.112	-.085	.262
- to engage in taking care of the environment.	.686	-.263	.027	.035	.324
- to experience nature in an urban environment.	.712	-.123	-.468	.231	-.034
- to be in nature.	.707	.405	.133	.266	-.196
- to gain knowledge about environmental matters.	.716	-.319	.231	.398	-.146
- to enjoy nature’s beauty and peace.	.761	.067	.485	.050	-.169
- to grow food.	.723	-.365	.308	-.006	.275
- to support the local economy.	.692	-.148	.021	-.435	-.284
- to contribute to social well-being.	.835	-.121	-.041	-.335	-.095
- to appreciate nature in the city.	.803	.100	.257	-.270	-.272
- to provide deeper meaning to social and economic food issues.	.745	-.191	.062	.018	.092
- where people, plants, and wildlife interact as part of the natural environment within a city.	.744	.244	-.034	.256	-.285

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

Table C11

Eigenvalues for PCA on Urban Farm Post-Place Meaning Survey

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.084	55.420	55.420	11.084	55.420	55.420
2	2.079	10.393	65.813	2.079	10.393	65.813
3	1.085	5.425	71.238	1.085	5.425	71.238
4	.883	4.415	75.652			
5	.679	3.397	79.050			
6	.615	3.076	82.125			
7	.563	2.813	84.939			
8	.472	2.360	87.299			
9	.442	2.209	89.508			
10	.367	1.835	91.344			
11	.307	1.536	92.879			
12	.286	1.428	94.308			
13	.250	1.251	95.559			
14	.202	1.010	96.569			
15	.177	.886	97.455			
16	.164	.819	98.275			
17	.130	.650	98.925			
18	.124	.621	99.546			
19	.059	.293	99.839			
20	.032	.161	100.000			

Extraction Method: Principal Component Analysis.

Table C12

Component Loadings for PCA on Urban Farm Post-Place Meaning Survey

Component Matrix[a]

The twenty statements on this page refers to the Urban Farm you will be spending time on this semester (ex. Butler's CUE Farm). Please choose the option that best matches your own personal response to each statement. This Urban Farm is a place...	Component		
	1	2	3
- to connect with nature.	.655	.395	.319
- to watch wildlife.	.504	.673	-.024
- where people can find nature.	.644	.436	.184
- where farming is an important part of the community.	.690	-.237	.461
- to find many species of wildlife and plants.	.688	.425	.203
- to value.	.766	-.117	.332
- to see environmental action in practice.	.828	-.194	-.121
- to learn.	.793	-.159	-.269
- to observe eco-friendly food production.	.791	-.356	-.086
- to engage in taking care of the environment.	.806	-.133	-.069
- to experience nature in an urban environment.	.843	.001	-.002
- to be in nature.	.678	.497	-.125
- to gain knowledge about environmental matters.	.818	-.043	.260
- to enjoy nature’s beauty and peace.	.819	.261	-.236
- to appreciate nature in the city.	.703	.297	-.332
- to provide deeper meaning to social and economic food issues.	.716	-.012	-.220
- where people, plants, and wildlife interact as part of the natural environment within a city.	.737	-.228	-.352
- to grow food.	.748	-.408	.222
- to support the local economy.	.760	-.358	.063
- to contribute to social well-being.	.812	-.264	-.107

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

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Curriculum Vitae

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Education

Ph.D. Applied Earth Sciences, IUPUI ***2021***

B.A. Biology, IUPUI ***2014***

B.S. Environmental Science, IUPUI ***2009***

Professional Experience

Henry M. Jackson Foundation ***Nov. 2020 – Current***

Center for Global Health Engagement Assessment, Monitoring, and Evaluation Analyst for Biological Threat Reduction Program

Reconnecting to Our Waterways ***June 2015 – July 2020***

ROW Fellow, Metric Data Researcher

Current Consulting LLC ***March 2020***

Technical Report Editor

Indiana Forest Alliance ***Sept. 2019***

Qualitative Data Consultant

Center for Urban Ecology & Sustainability – Butler University ***Aug. 2019 – Jan. 2020***

STEM Education Research Consultant

Central Indiana Community Foundation ***March – April 2017***

Grant Writer

STEM Education Innovation & Research Institute ***Aug. 2016 – Aug. 2019***

Research Assistant – NSF Award #1609219

IUPUI Applied Earth Sciences ***Aug. 2014 – Aug. 2019***

Research Assistant – NSF Award #1323117

Teaching Associate

Gilchrist & Soames ***Aug. 2008 – Aug. 2014***

Technical Services Intern, QC Technician, Microbiologist I, Microbiologist II

Volunteer Experience

Indiana Evaluation Association Member ***Jan. 2018 – Current***

Reconnecting to Our Waterways Education Co-Chair ***June 2015 – Current***

Presentations, Posters, and Publication

Rollings, A., & Brown, K. (2017). Hidden assets: Addressing Indianapolis' poorly perceived waterway landscape. Presentation, Midwest-Great Lakes Chapter of the Society for Ecological Restoration annual meeting, March 24 – 26, 2017, Grand Rapids, MI.

Rollings, A., & Brown, K. (2019). Multi-style interventions, one instrument: Let's get meta! Presentation, Indiana Evaluation Association annual meeting, October 18, 2019, Indianapolis, IN.

Angstmann, J., Sorge, B., Fore, G., & **Rollings, A.** (2018). Cultivating scientific literacy and action through place: Development and implementation of themed place-based experiential learning curriculum. Poster presentation, American Association for the Advancement of Science annual meeting, February 15-19, 2018, Austin, TX.

Rollings, A., Sorge, B., Fore, G., & Angstmann, J. (2018). Campus farm meets curriculum: Growing attachment and civic engagement in place-based experiential education environments. Poster presentation, American Association for the Advancement of Science annual meeting, February 15-19, 2018, Austin, TX.

Angstmann, J., Sorge, B., Fore, G., & **Rollings, A.** (2018). Cultivating scientific literacy and action through place: Development and implementation of themed place-based experiential learning curriculum. Poster presentation, Celebration of Innovations in Teaching and Learning annual conference, March 2018. Butler University, Indianapolis, Indiana.

Angstmann, J., Sorge, B., Fore, G., & **Rollings, A.** (2018). Undergraduate courses document ecosystem and community impacts of sustainable urban agriculture. Poster presentation, Indiana Small Farms annual conference, March 2018. Danville, Indiana.

Sorge, B., Angstmann, J., **Rollings, A.**, & Fore, G. (2019). Using place for developing learners: Early findings from the integration of a campus farm. Poster presentation, American Educational Research Association annual meeting, April 5 – 9, 2019, Toronto, Canada.

Angstmann, J.L., **Rollings, A.J.**, Fore, G.A., & Sorge, B.H. (2019). A pedagogical framework for the design and utilization of place-based experiential learning curriculum on a campus farm. *Journal of Sustainability Education, 20.*